

Japan, Army, 6th Military Technical  
Research Laboratory

Japan Army, 6th military technical  
Research Laboratory

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In this translation, the first seven columns, "No." through "Physiological effect", have been placed on one sheet and the last column, "Toxic character", has been placed on a second sheet. The "No." has been repeated on the second sheet in order that information in the two sheets can be easily matched. Page numbering is as follows: 1, 2, 3, etc. denote first sheets and 1a, 2a, 3a, etc. denote second sheets.

- As per agreement, the column entitled "Structural formula" has been left blank except in instances where an entry was absolutely necessary.
- It is to be noted that figures in the "No." column are not always in sequence.

- The last 60 entries in the original document did not bear numbers.

In order to facilitate the matching of sheets, numbers in parentheses have been provided.



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| No.  | Name                           | Structural formula | Physical state | Boiling point    | Melting point       | Physiological effect      |
|------|--------------------------------|--------------------|----------------|------------------|---------------------|---------------------------|
| 1.   | Chlor                          |                    | Gas            | -33.6            | -102                | Lung injurant             |
| 2.   | Brom                           |                    | Liquid         | 58.7             | - 7.3               | Lung injurant             |
| 3.   | Jod                            |                    | Solid          | 184.4            | 113                 | Lung injurant             |
| 4.   | Fluor                          |                    | Gas            | -187             | -223                | Lung injurant, vesicant   |
| 5.   | Cyan                           |                    | Gas            | -214             | - 34.4              | Systemic poison           |
| 6.   | Chlor cyan                     |                    | Gas            | 15.8             | - 7                 | Systemic poison, irritant |
| 7.   | Brom cyan                      |                    | Solid          | 61.5             | 52                  | Systemic poison, irritant |
| 8.   | Jod cyan                       |                    | Solid          |                  | 146.5 (sublimation) | Systemic poison, irritant |
| 9.   | Phosgen                        |                    | Gas            | 8.2              | -113                | Lung injurant             |
| 10.  | Brom phosgen                   |                    | Liquid         | 64-65            |                     | Lung injurant             |
| 11.  | Chlor brom phosgen             |                    | Liquid         | 25               |                     | Lung injurant             |
| 12.  | Cyan phosgen                   |                    | Gas            | 65.5/<br>740mm   | - 35 to<br>- 36     | Lung injurant             |
| 13.  | Diphosgen                      |                    | Liquid         | 128              |                     | Lung injurant             |
| 14a. | Diphosgen)                     | 2:1                |                |                  |                     |                           |
|      | mixed                          |                    |                |                  |                     |                           |
|      | b. Sym. Dichlor dimethylather) | 1:1                |                |                  |                     |                           |
|      | c.                             | 1:2                |                |                  |                     |                           |
| 15.  | Oxalsäure dichlorid            |                    | Liquid         | 64               | - 12                | Irritant                  |
| 16.  | Triphosgen                     |                    | Solid          | 124 (50mm)       | 78                  | Lung injurant             |
| 17.  | Dichlor formaldehyd oxim       |                    | Solid          | 129 53-54 (28mm) | 39.5                | Lacrimator, vesicant      |
| 18.  | Chloroform                     |                    | Liquid         | 61               |                     | Anesthetic                |
| 19.  | Methyl bromid                  |                    | Liquid         | 4                | 67                  |                           |
| 20.  | Methyl cyanid                  |                    | Liquid         | 81.6             | - 44.4              | Systemic poison, irritant |

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- | No.  | Toxic character  |
|------|--|
| 1.   | Intolerability limit: 150 mg/m <sup>3</sup> .  |
| 2.   | Somewhat weaker compared with Chlor.   |
| 3.   |  |
| 4.   | Rapidly affects eyes and mucous membranes. Upon contact with the skin, it produces burns and destroys tissues.   |
| 5.   | Toxicity is 1/5 that of cyanic acid.   |
| 6.   | Intolerability limit: 0.05 mg/L. Toxicity (inhalation): All die at ct equals (t equals 5 minutes) 3,750 (mouse), 7,500 (rabbit), over 7,500 (marmot).  |
| 7.   | Intolerability limit: 0.085 mg/L. Toxicity (inhalation): At ct equals 5,000, one out of five marmots dies within 7 days.   |
| 8.   | Toxicity is weaker than that of cyanic acid.   |
| 9.   | Intolerability limit: 20mg/m <sup>3</sup> . Lethal inhalation does: ct equals 1,200 (chicken), 7,000 (mouse), 2,200 (marmot: 50 percent die), 4,000 (cat), 8,000 (dog), 10,000 (rabbit: 50 percent die). |
| 10.  | Lethal inhalation does: ct equals over 2,500 (marmot), 50,000 (pigeon).  |
| 11.  |  |
| 12.  | Simple resolvability. Toxicity is not great.   |
| 13.  | Toxicity (50 percent lethal dose by inhalation): ct equals 2,300 (marmot), 12,000 (rabbit).  |
| 14a. | Toxicity (inhalation): ct equals 13,000, two out of six rabbits die. ct equals 5,000, five out of six marmots die.   |
| b.   | Toxicity (inhalation): ct equals 10,000, one out of six rabbits dies. ct equals 5,000, five out of six marmots die.  |
| c.   | Toxicity (inhalation): ct equals 10,000, none out of six rabbits dies. ct equals 5,000, five out of six marmots die.   |
| 15.  | Toxicity (inhalation): ct equals over 3,000 (marmot).  |
| 16.  | Weaker than diposgen.  |
| 17.  | ct equals 5,000-10,000: none dies within 7 days (rabbit). ct equals 5,000: none out of five dies (marmot). ct equals 10,000: one out of ten dies (marmot).   |
| 18.  | Anesthetic action is faster and better than methyl bromid but death rate is lower.   |
| 19.  | Anesthetic effect is lower than chloroform but death rate is higher.   |
| 20.  | Toxicity (inhalation): ct equals 15,000, none out of two rabbits dies.   |



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| No.  | Name                                   | Structural formula  | Physical state | Boiling point        | Melting point | Physiological effect        |
|------|--|---|----------------|----------------------|---------------|-----------------------------|
| 21.  | Methyl rhodanid                        |   | Liquid         | 130-133              | -51           | Systemic poison             |
| 22.  | Methyl isothiocyanat                   |   | Solid          | 115                  | 35            | Lacrimator                  |
| 24.  | Chlor methyl cyanid                    |   | Liquid         | 126-127<br>(resolve) |               | Systemic poison, irritant   |
| 25.  | Brom methyl cyanid                     |   | Liquid         | 142-150              |               | Systemic poison, irritant   |
| 26.  | Jod methyl cyanid                      |   | Liquid         | 162-164              |               | Systemic poison, irritant   |
| 27.  | Dichlor methyl cyanid                  |   | Liquid         | 112-113              | -23 -<br>-25  | Systemic poison, irritant   |
| 28.  | Di brom methyl cyanid                  |   | Liquid         | 162-163              | -19 -<br>-20  | Systemic poison, irritant   |
| 29.  | Trichlor methyl cyanid                 |   | Liquid         | 83-84                | -38 -<br>-40  | Systemic poison, irritant   |
| 30.  | Chlor methyl rhodanid                  |   | Solid          | 260-263              | 67            |                             |
| 31a. | Methyl cyanid (acetonitril)            | $C \begin{matrix} 1:4 \\ \text{mixed in} \\ b \\ 1 \\ n \\ e \\ 2 \\ a \\ t \\ 1 \\ o \end{matrix}$ | Liquid         |                      | -22           | Systemic poison             |
|      | Elau Sautre (CH <sub>3</sub> CN / HCN) |   |                |                      |               |                             |
| b.   |  | $1:2:3$   | Liquid         |                      | -34.5         | Systemic poison             |
| c.   |  | $1:1$   | Liquid         |                      | -42           | Systemic poison             |
| d.   |  | $3:2$   | Liquid         |                      | -45           | Systemic poison             |
| e.   |  | $4:1$   | Liquid         |                      | -45           | Systemic poison             |
| 31.  | Dichlor methyl rhodanid                |   |                |                      |               |                             |
| 32.  | Trichlor methyl rhodanid               |   |                |                      |               |                             |
| 33.  | Dichlor methan                         |   | Liquid         | 41.6                 |               | Anesthetic, systemic poison |

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- | No.  | Toxic character   |  |   |   |   |                        |  |                  |                         |
|--|---|--|---|---|---|------------------------|--|------------------|-------------------------|
| 22.  | Lethal inhalation dose: ct equals 5,000 (marmot) no deaths.   |  |   |   |   |                        |  |                  |                         |
| 23.  | Lethal inhalation dose: Weak, at ct equals 5,000 to 10,000 one dies (rabbit).   |  |   |   |   |                        |  |                  |                         |
| 24.  | Toxicity (inhalation): ct equals 5,000 no deaths (rabbit, marmot). Irritating action strong.  |  |   |   |   |                        |  |                  |                         |
| 25.  | Toxicity (inhalation): ct equals 5,000 (none out of two rabbits and one out of five marmots die). Irritating action strong.   |  |   |   |   |                        |  |                  |                         |
| 26.  | Toxicity (inhalation): ct equals 5,000 (none out of two rabbits and one out of five marmots die). Irritating action strong.   |  |   |   |   |                        |  |                  |                         |
| 27.  | Toxicity (inhalation): ct equals over 10,000 is lethal dose for rabbits and marmots. Has lacrimatory effect but weak.   |  |   |   |   |                        |  |                  |                         |
| 28.  | Toxicity (inhalation): ct equals over 10,000 is lethal dose for rabbits and marmots. Has lacrimatory effect but weak compared with known military gases.  |  |   |   |   |                        |  |                  |                         |
| 29.  | Toxicity (inhalation): ct equals over 10,000 is lethal dose for rabbits and marmots. Has lacrimatory effects but weak.  |  |   |   |   |                        |  |                  |                         |
| 30.  |   |  |   |   |   |                        |  |                  |                         |
| 21a.   | <table border="0"><tr><td>Toxic density <math>\text{mg}/\text{m}^3</math></td><td>Inhalation time.</td></tr><tr><td><math>\text{mg}/\text{m}^3</math> equals 1,000 (5 minutes)</td><td>Four out of four die (within 1 minute 50 seconds)</td></tr><tr><td>rabbit 650 (5 minutes)</td><td>Two out of three die (within 4 minutes 30 seconds)</td></tr><tr><td>500 (10 minutes)</td><td>None out of three dies.</td></tr></table> | Toxic density $\text{mg}/\text{m}^3$             | Inhalation time.                                    | $\text{mg}/\text{m}^3$ equals 1,000 (5 minutes) | Four out of four die (within 1 minute 50 seconds) | rabbit 650 (5 minutes) | Two out of three die (within 4 minutes 30 seconds) | 500 (10 minutes) | None out of three dies. |
| Toxic density $\text{mg}/\text{m}^3$             | Inhalation time.  |  |   |   |   |                        |  |                  |                         |
| $\text{mg}/\text{m}^3$ equals 1,000 (5 minutes)  | Four out of four die (within 1 minute 50 seconds)   |  |   |   |   |                        |  |                  |                         |
| rabbit 650 (5 minutes)                           | Two out of three die (within 4 minutes 30 seconds)  |  |   |   |   |                        |  |                  |                         |
| 500 (10 minutes)                                 | None out of three dies.   |  |   |   |   |                        |  |                  |                         |
| b.   | <table border="0"><tr><td><math>\text{mg}/\text{m}^3</math> equals 1,000 (5 minutes)</td><td>Four out of four die (within 3 minutes 30 seconds)</td></tr><tr><td>rabbit 800 (10 minutes)</td><td>One out of four dies (within 7 minutes)</td></tr></table>  | $\text{mg}/\text{m}^3$ equals 1,000 (5 minutes)  | Four out of four die (within 3 minutes 30 seconds)  | rabbit 800 (10 minutes)                         | One out of four dies (within 7 minutes)           |                        |  |                  |                         |
| $\text{mg}/\text{m}^3$ equals 1,000 (5 minutes)  | Four out of four die (within 3 minutes 30 seconds)  |  |   |   |   |                        |  |                  |                         |
| rabbit 800 (10 minutes)                          | One out of four dies (within 7 minutes)   |  |   |   |   |                        |  |                  |                         |
| c.   | <table border="0"><tr><td><math>\text{mg}/\text{m}^3</math> equals 1,100 (5 minutes)</td><td>Three out of four die (within 4 minutes 30 seconds)</td></tr><tr><td>rabbit 1,000 (10 minutes)</td><td>One out of seven dies (within 4 minutes)</td></tr></table>  | $\text{mg}/\text{m}^3$ equals 1,100 (5 minutes)  | Three out of four die (within 4 minutes 30 seconds) | rabbit 1,000 (10 minutes)                       | One out of seven dies (within 4 minutes)          |                        |  |                  |                         |
| $\text{mg}/\text{m}^3$ equals 1,100 (5 minutes)  | Three out of four die (within 4 minutes 30 seconds)   |  |   |   |   |                        |  |                  |                         |
| rabbit 1,000 (10 minutes)                        | One out of seven dies (within 4 minutes)  |  |   |   |   |                        |  |                  |                         |
| d.   | <table border="0"><tr><td><math>\text{mg}/\text{m}^3</math> equals 1,200 (10 minutes)</td><td>Two out of four die (within 10 minutes)</td></tr><tr><td>rabbit 1,000 (10 minutes)</td><td>None out of five dies.</td></tr></table>   | $\text{mg}/\text{m}^3$ equals 1,200 (10 minutes) | Two out of four die (within 10 minutes)             | rabbit 1,000 (10 minutes)                       | None out of five dies.                            |                        |  |                  |                         |
| $\text{mg}/\text{m}^3$ equals 1,200 (10 minutes) | Two out of four die (within 10 minutes)   |  |   |   |   |                        |  |                  |                         |
| rabbit 1,000 (10 minutes)                        | None out of five dies.  |  |   |   |   |                        |  |                  |                         |
| e.   | <table border="0"><tr><td><math>\text{mg}/\text{m}^3</math> equals 2,500 (5 minutes)</td><td>Three out of four die (within 3 minutes 30 seconds)</td></tr><tr><td>rabbit 1,000 (10 minutes)</td><td>None out of five dies.</td></tr></table>  | $\text{mg}/\text{m}^3$ equals 2,500 (5 minutes)  | Three out of four die (within 3 minutes 30 seconds) | rabbit 1,000 (10 minutes)                       | None out of five dies.                            |                        |  |                  |                         |
| $\text{mg}/\text{m}^3$ equals 2,500 (5 minutes)  | Three out of four die (within 3 minutes 30 seconds)   |  |   |   |   |                        |  |                  |                         |
| rabbit 1,000 (10 minutes)                        | None out of five dies.  |  |   |   |   |                        |  |                  |                         |
| 31.  |   |  |   |   |   |                        |  |                  |                         |
| 32.  |   |  |   |   |   |                        |  |                  |                         |
| 33.  | Seriously weakens respiratory and heart functions.  |  |   |   |   |                        |  |                  |                         |



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| No. | Name  | Structural formula | Physical state | Boiling point   | Melting point | Physiological effect           |
|-----|---|--------------------|----------------|-----------------|---------------|--------------------------------|
| 34. | Dibrom methane                                  |                    | Liquid         | 95.5-<br>96.5   |               | Systemic poison                |
| 35. | Methylen cyanid                                 |                    | Solid          | 218-220         | 29            |                                |
| 36. | Methylen rhodanid                               |                    | Solid          |                 | 102           | Irritant                       |
| 37. | Vinyl chlorid                                   |                    | Gas            | -12.5<br>-15    |               |                                |
| 38. | Vinyl bromid                                    |                    | Liquid         | 18              |               | Irritant                       |
| 39. | Acetylene dichlorid                             |                    | Liquid         | 55              |               | Anesthetic                     |
| 40. | Acetylene dibromid                              |                    | Liquid         | 110             |               |                                |
| 41. | Aethyl bromid                                   |                    | Liquid         | 38.4            | -115.5        | Systemic poison, irritant      |
| 42. | Propionitril                                    |                    | Liquid         | 97              | -103.5        | Systemic poison, irritant      |
| 43. | Propionitril phosphogen                         |                    | Solid          |                 | 98            |                                |
| 44. | Propionitril) molecular<br>Diphosgen ) compound |                    | Solid          | about<br>200    |               |                                |
| 45. | Aethyl isocyanid                                |                    | Liquid         | 75-78           | 66            | Systemic poison, irritant      |
| 46. | Aethyl rhodanid                                 |                    | Liquid         | 141-142         |               | Systemic poison                |
| 47. | Aethyl iso thiocyanat                           |                    | Liquid         | 129             |               | Lacrimator, irritant, vesicant |
| 48. | B-chlor aethyl cyanid                           |                    | Liquid         | 174-176         |               |                                |
| 49. | B-chlor aethyl (rhodanid)                       |                    | Liquid         | 202-203         | -20 or lower  | Irritant                       |
| 50. | Aethylen rhodanid                               |                    | Solid          |                 | 90            | Irritant                       |
| 51. | Allyl chlorid                                   |                    | Liquid         | 44-45           | -136.4        | Lacrimator                     |
| 52. | Allyl bromid                                    |                    | Liquid         | 70-71           |               | Irritant                       |
| 53. | Allyl hydroxy cyanid                            |                    | Liquid         | 93-94<br>(17mm) |               |                                |

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## No. Toxic character

34. Toxicity (inhalation): Weak; at ct equals 5,000, rabbits and marmots do not die. Irritating action: Hardly any.
- 35.
36. Vapor containing this element has irritating effect. Strongly irritates the mucous membranes.
- 37.
38. Irritating action weak. Anesthetic effect not detected at ct equals 14,000 (% equals 10%).
39. Possesses anesthetic effect.
- 40.
41. Possesses anesthetic effect. Irritating action is greater than that of chloroethyl.
42. Toxicity of this agent is extremely weak; about same as acetonitril.
43. Toxicity (inhalation): ct equals 2,200 to 4,400. None out of five dies (marmot).
44. Toxicity (inhalation): ct equals 10,000 to 15,000, no deaths (rabbit). Lethal inhalation effect is weak.
45. Toxicity is 1/3 that of cyanic acid. Toxicity greater than that of propionitril.
46. Lethal dose (hypodermic injection): 20 mg/kg, three out of five rabbits die. 10 mg/kg, four out of five rabbits die. Lethal dose (inhalation): ct equals 5,000, none out of five dies (marmot).
47. Toxicity (inhalation): ct equals 3,000 (rabbit and marmot). Strongly irritating, causes considerable drivelling and tears. Also attacks cornea following day. Irritant and lacrimatory effects: violently attacks the skin.
- 48.
49. Unpleasant irritating odor. No vesicant action.
50. Toxicity (inhalation): ct equals 5,000. None out of five dies (marmot). Strong irritating action.
- 51.
52. Its vapor irritates the conjunctiva and respiratory organs. Causes vertigo and headache and irritates the lungs.
- 53.

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| No. | Name                             | Structural<br>Formula | Physical<br>state | Boiling<br>point                        | Melting<br>point | Physiological<br>effect         |
|-----|----------------------------------|-----------------------|-------------------|---|------------------|---------------------------------|
| 54. | Allyl cyanid                     |                       | Liquid            | 117.8                                   |                  | Systemic<br>poison              |
| 55. | Allyl isocyanid                  |                       |                   |   |                  |                                 |
| 56. | Allyl isothio cyanat             |                       | Liquid            | 148.2                                   | -80              | Lacrimator,<br>vesicant         |
| 57. | Propyl cyanid                    |                       | Liquid            | 117.6                                   | -111.9           | Systemic<br>poison              |
| 58. | Propyl isothio cyanat            |                       | Liquid            | 153                                     |                  | Lacrimator                      |
| 59. | Butyl cyanid                     |                       | Liquid            | 140                                     |                  | Systemic<br>poison,<br>irritant |
| 60. | Acetyl chlorid                   |                       | Liquid            | 50.9                                    |                  | Irritant                        |
| 61. | Acetyl bromid                    |                       | Liquid            | 75.1                                    |                  | Irritant                        |
| 62. | Acetyl jodid                     |                       | Liquid            | 108                                     |                  | Irritant                        |
| 63. | Acetyl fluorid                   |                       | Liquid            | 20-23                                   |                  | Irritant                        |
| 64. | Acetyl isothio cyanat            |                       | Liquid            | 129-130                                 |                  | Lacrimator                      |
| 65. | Chlor acetyl chlorid             |                       | Liquid            | 105                                     |                  | Irritant                        |
| 66. | Chlor acetyl fluorid             |                       | Liquid            | 65-75                                   |                  | Irritant,<br>lacrimator         |
| 67. | Brom acetyl bromid               |                       | Liquid            | 149-150                                 |                  |                                 |
| 68. | Chlor acetyl bromid              |                       | Liquid            | 127                                     |                  | Irritant                        |
| 69. | Cyan acetyl bromid               |                       | Solid             | 118                                     | 145              |                                 |
| 70. | Trichlor acetyl chlorid          |                       | Liquid            | 142                                     |                  | Irritant                        |
| 71. | Trichlor acetyl bromid           |                       | Liquid            | 121-122                                 |                  |                                 |
| 72. | Trichlor acetyl cyanid           |                       | Liquid            | 121-122                                 |                  |                                 |
| 73. | Prephenyl isothio cyanat         |                       | Liquid            | 146-149                                 |                  | Lacrimator                      |
| 74. | Hexachlorid acetyl               |                       | Liquid            | 222-224<br>(Resolve)<br>14.0<br>(110mm) |                  | Irritant                        |
| 75. | Trichlor essigsaeure<br>anhydrid |                       | Liquid            |   |                  | Irritant                        |



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No. Toxic character

54. Toxicity (inhalation): Toxic character similar to that of cyanic acid.
- 55.
56. Toxicity (inhalation): ct equals 5,000 (marmot). Irritation weak.
57. Symptoms resemble those of cyanic acid.
58. Toxicity (inhalation): Weak. Irritant and lacrimatory effects fairly strong but very weak when compared with chlor aceto phenone.
59. Lethal dose (hypodermic injection): 100 mg/kg. Two out of three die (rabbit).
60. Lethal dose (hypodermic injection): 20 mg/kg. Two out of three die (rabbit). Toxicity (inhalation): ct equals 20,000. None out of three dies.
61. Lethal dose (hypodermic injection): 20 mg/kg. One out of three dies (rabbit). Toxicity (inhalation): ct equals 5,000. None out of three dies (marmot), ct equals 20,000 none out of three dies. Irritating action. Very weak when compared with known military gases.
62. Lethal dose (hypodermic injection): 20 mg/kg, none out of three dies (rabbit). Toxicity (inhalation): ct equals 5,000, none out of three dies (marmot), ct equals 20,000, one death in three (marmot). Irritating action: very weak when compared with known military gases.
63. Lethal dose (hypodermic injection): 20 mg/kg, none out of three dies (rabbit). Toxicity (inhalation): ct equals 20,000, none out of three dies (rabbit).
64. Toxicity (inhalation): ct equals 5,000 (none out of five dies (rabbit and marmot). Irritating action fairly strong.
- 65.
66. Irritant and lacrimatory symptoms very weak.
- 67.
68. Very weak as irritant and lacrimator. Lethal density is ct equals over 10,000.
- 69.
70. Toxicity (inhalation): ct equals over 4,500. 50 percent of marmots die.
71. Toxicity (inhalation): ct equals 20,000. No deaths (marmot).
72. Toxicity (inhalation): ct equals 20,000. Marmots do not die. Toxicity roughly 1/10 of cyanic acid.
73. Slight irritant and lacrimatory effects. Toxicity (inhalation): no rabbits or marmots die at ct equals 5,000.
74. Toxicity (inhalation): ct equals 15,000 (marmot).
75. Toxicity (inhalation): ct equals 30,000 (marmot).

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| No. | Name   | Structural formula | Physical state | Boiling point                | Melting point | Physiological effect         |
|-----|--|--------------------|----------------|------------------------------|---------------|------------------------------|
| 76. | Ameisensaure methyl ester                      |                    | Liquid         | 32                           | -100.4        | Irritant                     |
| 77. | Chlor ameisensaure methyl ester                |                    | Liquid         | 71.4                         |               | Lung injur-<br>ant, irritant |
| 78. | Cyan ameisensaure methyl                       |                    | Liquid         | 36.5                         |               | Lung injur-<br>ant           |
| 79. | Mono chlor essigsäure                          |                    | Solid          | 188.5-<br>189.5              | 50            |                              |
| 80. | Mono brom essigsäure                           |                    | Solid          | 198                          | 49-50         | Lacrimator,<br>irritant      |
| 81. | Mono cyan essigsäure                           |                    |                |                              |               |                              |
| 82. | Chlor ameisensaure chlor methyl ester          |                    | Liquid         | 106.5                        |               | Lung injur-<br>ant, irritant |
| 83. | Chlor ameisensaure dichlor methyl ester        |                    | Liquid         | 110-111                      |               | Lung injur-<br>ant, irritant |
| 13. | Diphosgen (chlor ameisensaure trichlor-methyl) |                    | Liquid         | 128                          |               | Lung injur-<br>ant           |
| 84. | Brom essigsäure methyl ester                   |                    | Liquid         | 144                          |               | Irritant                     |
| 85. | Jod essigsäure methyl ester                    |                    | Liquid         | 169-171<br>(some resolution) |               | Lacrimator                   |
| 86. | Rhodan essigsäure methyl ester                 |                    | Liquid         | 125-122<br>(16mm)            |               |                              |
| 87. | Dezachlor iso propyl chlor formiat             |                    | Solid          | 30-32                        |               | Lung injur-<br>ant           |
| 88. | Heptachlor iso propyl chlor formiat            |                    | Solid          | 128-162<br>(50mm)            |               | Lung injur-<br>ant           |
| 89. | Trichlor methyl tri-chlor acetat               |                    | Solid          | 171-172                      | 34            | Lung injur-<br>ant           |
| 90. | Dibrom vinyl acetat                            |                    | Liquid         | 80-81<br>(10mm)              |               | Irritant                     |
| 91. | Chlor ameisensaure ethyl ester                 |                    | Liquid         | 94-95                        |               | Irritant                     |
| 92. | Brom ameisensaure athyl ester                  |                    | Liquid         | 133 (some resolution)        |               | Irritant                     |
| 93. | Cyan ameisensaure athyl ester                  |                    | Liquid         | 115                          |               | Lung injur-<br>ant           |

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76. Toxic character.

Has anesthetic and irritant effects.

77. Vapor violently irritates the mucous membranes. Toxicity (inhalation): very weak. No deaths at ct equals 15,000 (rabbit); ct equals 4,400 (marmot).

78. No irritating action. Has effects similar to that of cyanic acid.

79. Causes rotting and destruction of epidermis.

80. Attacks the mucous membrane, affects throat, eye and nose, and causes coughing, tears, and running nose.

81. Irritant and lacrimatory effects weak. Toxicity (inhalation): one out of five marmots dies at ct equals 4,400.

82. Irritant and lacrimatory effects weak. Toxicity (inhalation): weak. no rabbits die at ct equals 15,000 and two out of five (40%) marmots die at ct equals 3,300.

83. Irritating action is weaker than acetic or dichloroester but toxicity is higher. Decomposes (boils) qualitatively but its action is weaker.

84. Strongly affects the eyes.

85. Causing rotting of and irritates the mucous membranes.

86. Toxicity (inhalation): ct equals under 40,000 (marmot, pigeon).

87. Toxicity (inhalation): ct equals under 40,000 (marmot, pigeon).

88. Toxicity (inhalation): ct equals 2,500 (marmot).

89. Slightly irritating, no lacrimatory effect. Toxicity (inhalation): ct equals 5,000. 20% of marmots die.

90. Irritates the mucous membranes of eye, skin, and nose.

91. Strongly irritates the mucous membranes.

92. Effect is exactly the same as methyl ester. Toxicity is very weak.



| No.  | Name   | Structural formula | Physical state | Boiling point     | Melting point | Physiological effect |
|------|--|--------------------|----------------|-------------------|---------------|----------------------|
| 94.  | Chlor ameisensaure $\beta$ -chlor athyl ester    |                    | Liquid         | 152-153           |               | Irritant             |
| 95.  | Chlor ameisensaure pentachlor athyl ester        |                    | Solid          | 206-207           | 26-27         | Lung injur-ant       |
| 96.  | Monochlor essigsäure athyl ester                 |                    | Liquid         | 144-146           |               | Lacrimator           |
| 97.  | Monojod essigsäure athyl ester                   |                    | Liquid         | 178               |               | Lacrimator           |
| 98.  | Monobrom essigsäure athyl ester                  |                    | Liquid         | 159               |               | Lacrimator           |
| 99.  |  |                    |                |                   |               |                      |
| 100. | Monocyan essigsäure athyl ester                  |                    | Liquid         | 207               |               |                      |
| 101. | $\alpha/\beta$ Dibrom propion-säure methyl ester |                    | Liquid         | 205               |               |                      |
| 102. | Brom essigsäure $\beta$ -brom athyl ester        |                    | Liquid         | 147-148 (30mm)    |               |                      |
| 103. | Chlor essigsäure $\beta$ -chlor athyl ester      |                    | Liquid         | 197-198           |               | Lacrimator           |
| 104. | Brom essigsäure $\beta$ -chlor athyl             |                    | Liquid         | 213-215           |               | Lacrimator           |
| 105. | Jod essigsäure $\beta$ -chlor athyl ester        |                    | Liquid         |                   |               | Lacrimator           |
| 106. | Brom essigsäure $\alpha/\beta$ dibrom athyl      |                    |                |                   |               |                      |
| 107. | Monochlor iso butyl-chlor format                 |                    | Liquid         | 153-173 (30mm)    |               | Lung injur-ant       |
| 108. | Perchlor oxalsäure dimethyl ester                |                    | Solid          | 350-400 (resolve) | 80.5          | Lung injur-ant       |
| 109. | Perchlor oxalsäure diathyl ester                 |                    | Solid          | 144 (resolve)     |               | Lung injur-ant       |
| 110. | Chlor ameisensaure heptachlor propyl ester       |                    | Solid          | 185 (50mm)        |               | Lung injur-ant       |
| 111. | Trichlor methyl methoxy format                   |                    | Liquid         | 165               |               | Lung injur-ant       |



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| No.  | Toxic character  |
|------|--|
| 94.  | Irritating and lacrimatory effects are fairly strong but weaker than chloroaceto phenone. Toxicity (inhalation): Lethal effect by inhalation is weak.          |
| 95.  | Toxicity (inhalation): $LD_{50}$ equals 2,500 (marmot).  |
| 96.  | Toxicity (inhalation): Hardly any changes detected in rabbits and marmots at $LD_{50}$ equals 5,000.   |
| 97.  | Tolerability limit: approximately 25 mg/m <sup>3</sup> . Lethal dose (inhalation): Dose of five rabbits and one of five marmots die at $LD_{50}$ equals 5,000. |
| 98.  | Tolerability limit: 20 mg/m <sup>3</sup> . Lethal dose (inhalation): $LD_{50}$ equals 5,000 (rabbit, marmot).  |
| 99.  |  |
| 100. | Toxicity (inhalation): Hardly any changes detected in rabbits and marmots at $LD_{50}$ equals 5,000.   |
| 101. |  |
| 102. | Toxicity (inhalation): Hardly any changes detected in marmots at $LD_{50}$ equals 5,000.   |
| 103. | Toxicity (inhalation): Marmots do not die at $LD_{50}$ equals 5,000.   |
| 104. | Toxicity (inhalation): Marmots do not die at $LD_{50}$ equals 5,000. Irritant and lacrimatory effects are slight.  |
| 105. | Toxicity (inhalation): Marmots do not die at $LD_{50}$ equals 5,000. Irritant and lacrimatory effects are slight.  |
| 106. |  |
| 107. | Lethal dose (inhalation): $LD_{50}$ equals 25,000 (marmot).  |
| 108. | Toxicity (inhalation): $LD_{50}$ equals over 6,500 (marmot). $LD_{50}$ equals 10,000 (pigeon).   |
| 109. | Toxicity (inhalation): $LD_{50}$ equals over 12,000 (marmot). $LD_{50}$ equals over 30,000 (pigeon).   |
| 110. | Toxicity (inhalation): $LD_{50}$ equals 20,000 (marmot). $LD_{50}$ equals under 20,000 (pigeon).   |
| 111. | Toxicity (inhalation): $LD_{50}$ equals over 7,000 (50 percent of marmots die).  |

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|      | Structural<br>Formula                    | Physical<br>State | Boiling<br>Point                        | Melting<br>Point | Physiological<br>Effect |
|------|--|-------------------|---|------------------|-------------------------|
| 112. | Trichlor methoxy<br>methyl formiat       | Liquid            | 44-45<br>(50mm)                         |                  | Lung injur-<br>ant      |
| 113. | Dichlor acetonyl<br>formiat              | Liquid            | 141<br>(110mm)                          |                  | Lung injur-<br>ant      |
| 114. | Dichlor acetonyl<br>chlor formiat        |                   |   |                  |                         |
| 115. | Trichlor methyl-<br>oxalyl chlorid       | Liquid            | Approx-<br>imately<br>45-50<br>(30mm)   |                  | Lung injur-<br>ant      |
| 116. | Hexachlor dimethyl<br>malonat            | Liquid            | Approx-<br>imately<br>151-174<br>(50mm) |                  | Lung injur-<br>ant      |
| 117. | Brom malonsauise<br>diathyl ester        | Liquid            | 233-235                                 |                  | Lacrimator              |
| 118. | Dibrom malonsauise<br>diathyl ester      | Liquid            | 250-256<br>(resolve)                    |                  | Lacrimator              |
| 119. | Formaldehyd                              | Gas               | -21                                     | -92              | Irritant                |
| 120. | Acetaldehyd                              | Liquid            | 21                                      | -123             | Irritant                |
| 121. | Weyl aldehyd (acrolein)                  | Liquid            | 52.4                                    | -87.5            | Lacrimator              |
| 122. | Brom acetaldehyd                         | Liquid            | 80-105                                  |                  | Lacrimator              |
| 123. | Jod acetaldehyd                          | Liquid            |   |                  | Lacrimator              |
| 124. | Cyan acetaldehyd                         | Liquid            | 71.5                                    | -20              |                         |
| 125. | Dichlor acetaldehyd                      | Liquid            | 87.5-<br>90.5                           |                  | Lacrimator<br>Irritant  |
| 126. | Dibrom acetaldehyd                       | Liquid            | 142                                     |                  | Irritant                |
| 127. | (Chloral) trichlor<br>acetaldehyd        | Liquid            | 97.7                                    | -57.5            | Lacrimator              |
| 128. | (Bromal) tribrom<br>acetaldehyd          | Liquid            | 174                                     |                  |                         |
| 129. | Chloral cyan hydrin                      | Solid             | 215-230                                 | 60-81            | Systemic<br>poison      |
| 131. | Croton aldehyd                           | Liquid            | 102                                     | -69              | Irritant                |
| 132. | $\alpha,\beta$ Dibrom propion<br>aldehyd | Liquid            | 86.4<br>(18mm)                          |                  | Irritant                |

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- Toxic character
- 112. Toxicity (inhalation): ct equals over 7,000 (marmot).
  - 113. Toxicity (inhalation): ct equals 5,000 (marmot).
  - 114.
  - 115. Toxicity (inhalation): ct equals over 3,000 (marmot).
  - 116. Toxicity (inhalation): ct equals under 30,000 (marmot, pigeon).
  - 117. Toxicity (inhalation): marmots do not die at ct equals 5,000. Irritant and lacrimatory effects are weak.
  - 118. Toxicity (inhalation): marmots do not die at ct equals 5,000. Irritant and lacrimatory effects are weak.
  - 119. Strongly irritates the mucous membranes and has anesthetic effects.
  - 120. Strongly irritates the mucous membranes and has anesthetic effects.
  - 121. Intolerability limit: 50 mg/m<sup>3</sup>.
  - 122. Strongly irritates the mucous membranes.
  - 123. Vapor irritates the eyes.
  - 124.
  - 125. Vapor strongly irritates the eyes.
  - 126. Has irritating odor and injures the skin and mucous membranes.
  - 127. Has lacrimatory effect. Upon contact with the skin, it causes pain and eruptions.
  - 128. Exposure of bronchi causes temporary stimulation, then hypoxia, and finally weakens the respiratory and heart functions.
  - 129.
  - 130. Has local irritating effect and causes difficulty in breathing.
  - 131.







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## Toxic character

133. Has anesthetic effect.
134. Lethal effect by inhalation is very weak.
135. Toxicity (inhalation): Irritated at ct equals 5,000 (rabbit, marmoset).
136. Toxicity (inhalation): Irritating action is fairly strong at ct equals 5,000 (rabbit and marmoset). Rabbits: 100 percent die at 20 mg/kg.
- 137.
138. Lethal dose (inhalation): 33 percent die at ct equals 4,000. 83 percent die at 10,000 (marmoset).
139. Lethal dose (inhalation): 66 percent die at ct equals 4,800. Irritating effect is weak and the gas is inferior to chloroaceto phosphene.
140. Toxicity (inhalation): Rabbits and marmosets do not die at ct equals 2,000. However, irritating effect is comparatively strong.
141. With lethal effect by inhalation and irritating and lacrimatory effects are weak.
142. Toxicity is extremely weak when compared with known military gases. Lethal inhalation density is ct equals over 20,000.
- 143.
144. Lethal effect by inhalation is weak. Markedly inferior to phosgene. Lacrimatory effect is very weak.
145. Toxicity (inhalation): marmosets do not die at ct equals 4,000.
- 146.
- 147.
148. Toxicity (inhalation): at ct equals 5,000, has fairly strong irritating effect (rabbit, marmoset).
149. Toxicity (inhalation): One out of five marmosets dies at ct equals 4,000. Two out of four rabbits die at ct equals 15,000. Irritating and lacrimatory effects are weak.
150. Toxicity (inhalation): One out of five marmosets died at ct equals 4,000. None out of four rabbits dies at ct equals 15,000.

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|       |  | Structural<br>Formula | Physical<br>State | Boiling<br>Point      | Melting<br>Point | Physiological<br>Action                        |
|-------|--|-----------------------|-------------------|-----------------------|------------------|--|
| 14a.  | Mixed (Sym dichlor dimethyl ether          | com-                  | 2:1 Liquid        |                       |                  |  |
| b.    | (Diphosgen                                 | binig<br>ratio        | 1:1 Liquid        |                       |                  |  |
| c.    |  |                       | 1:2 Liquid        |                       |                  |  |
| 151.  | Mixed (Sym dichlor dimethyl ether (Phosgen | 2<br>..<br>1          | Liquid            |                       |                  | Irritant,<br>lung injur-<br>ant                |
| 152a. | (Sym dichlor dimethyl ether mixed          | 5:1                   | Liquid            |                       |                  | Systemic<br>poison                             |
| b.    | (Blau saure                                | 5:2                   | "                 |                       |                  | "  |
| c.    |  | 5:3                   | "                 |                       |                  | "  |
| d.    |  | 5:4                   | "                 |                       |                  | "  |
| e.    |  | 5:5                   | "                 |                       |                  | "  |
| 153.  | Isopropenyl chlor<br>formiat               |                       | Liquid            | 93                    |                  | Lacrimator,<br>irritant                        |
| 154.  | Perchlor methyl<br>merkaptan               |                       | Liquid            | 149                   |                  | Lacrimator,<br>irritant,<br>lung injur-<br>ant |
| 155.  | Perbrom methyl<br>merkaptan                |                       | Solid             | 108                   |                  | Lacrimator,<br>irritant,<br>lung injur-<br>ant |
| 156.  | Chlor benzal                               |                       | Liquid            | 132                   | -45              |  |
| 157.  | Brom benzal                                |                       | Liquid            | 155.6                 | -30.5            |  |
| 158.  | Jod benzal                                 |                       | Liquid            | 188.5                 | -28.5            |  |
| 159.  | Cyan benzal                                |                       | Liquid            | 190.7                 | -12.9            | Systemic<br>poison                             |
| 160.  | Isothio cyan benzal                        |                       | Liquid            | 221                   | -21              |  |
| 161.  | Benzyl chlorid                             |                       | Liquid            | 179                   | -48              | Lacrimator,<br>irritant                        |
| 162.  | Benzyl bromid                              |                       | Liquid            | 191                   | -3.9             | Lacrimator,<br>irritant                        |
| 163.  | Benzyl jodid                               |                       | Solid             | 225<br>(re-<br>solve) | 24.1             | Lacrimator,<br>irritant                        |
| 164.  | Benzyl cyanid                              |                       | Liquid            | 231.7                 | -24.6            | Systemic<br>poison                             |

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## No. Toxic character

- 14a. Toxicity (inhalation): Two out of six rabbits die at  $ct$  equals 15,000. Five out of six marmots die at 5,000.
15. Toxicity (inhalation): One out of six rabbits die at  $ct$  equals 10,000. Five out of six marmots die at 5,000.
16. Toxicity (inhalation): None out of six rabbits die at  $ct$  equals 10,000. Five out of six marmots die at 5,000.
17. Estimated  $ct$  equals 7,000. None out of four dies (rabbit).  
Toxicity 10,000. Three deaths in four (rabbit).  
(inhalation) 7,000. One death in six (marmot).
- 152a. Toxicity Inhalation time  
 $mg/m^3$  equals 1,000 (5 mins.) 1 out of 4 within 3 mins.  
(rabbit) 800 ( " ) 1 out of 4 within 5 mins.  
500 ( " ) 1 out of 4 within 5 mins.
- b. Toxicity  
 $mg/m^3$  equals 1,000 (5 mins.) 4 deaths in 4 within 5 mins.  
(rabbit) 700 ( " ) 1 death in 4 within 4 mins.
- c. Toxicity  
 $mg/m^3$  equals 1,000 (5 mins.) 2 deaths in 5 within 4 mins.  
(rabbit) 800 ( " ) 1 death in 4 within 3 mins.
- d. Toxicity  
 $mg/m^3$  equals 1,000 (5 mins.) 4 deaths in 4 within 5 mins.  
(rabbit) 900 ( " ) 3 deaths in 4 within 7 mins.
- e. Toxicity  
 $mg/m^3$  equals 1,000 (5 mins.) None out of four dies.  
(rabbit) 1,300 ( " ) 4 deaths in 4 within 5 mins.
153. Toxicity (inhalation): None out of five marmots die at  $ct$  equals 10,000.
154. Toxicity (inhalation): Four out of five die at  $ct$  equals 5,000.
155. Toxicity (inhalation): One out of five marmots die at  $ct$  equals 1,000. Two out of five marmots die at 5,000.
- 156.
- 157.
- 158.
159. Lethal effect by inhalation is at  $ct$  equals over 3,000 (rabbit).
- 160.
161. Lethal effect is strong. Intolerable limit for over 15 minutes: 0.025 mg/L.
162. Intolerability limit: 35-40 mg/m<sup>3</sup>.
163. Irritating effect is stronger than brom benzyl.
164. No effect on the toxicity of nasal cavity. The toxicity is over the whole body.



|   | Structural<br>Formula | Physical<br>State | Boiling<br>Point  | Melting<br>Point | Physiological<br>Action |
|---|-----------------------|-------------------|-------------------|------------------|-------------------------|
| 166. Benzyl iso cyanid                      |                       | Liquid            | 220-221           |                  |                         |
| 168. Benzyl rhodanid                        |                       | Liquid            | 230-235           | 4.1              | Systemic<br>poison      |
| 169. Benzyl isothio cyanat                  |                       | Liquid            |                   |                  | Irritant                |
| 170. Benzal chlorid                         |                       | Liquid            | 205.2             | -16.1            | Lacrimator              |
| 170. Benzal bromid                          |                       |                   |                   |                  |                         |
| 171. Chlor benzyl cyanid                    |                       | Liquid            | 229               | -33-36           | Lacrimator              |
| 172. Brom benzyl cyanid                     |                       | Solid             | 259               | 29               | Lacrimator              |
| 174. 1,1-Dibrom styrol                      |                       | Liquid            | 150-160           | -43              | Lacrimator              |
| 175. Dibrom styrol                          |                       | Liquid            | 253-254           | 60               |                         |
| 176. Benzylsulfure chlorid                  |                       | Liquid            | 85-86<br>(8mm)    |                  | Lung injur-<br>ant      |
| 177. 5-chlor athyl phenyl<br>ether          |                       | Solid             | 220               | 2.8              |                         |
| 178. Phenyl-brom essigsäure<br>methyl ester |                       | Liquid            | 125<br>(7mm)      |                  | Lacrimator              |
| 179. Phenyl-brom essigsäure<br>ethyl ester  |                       | Liquid            | 116-115<br>(55mm) |                  | Lacrimator              |
| 180. 2-chlor benzyl chlorid                 |                       | Solid             | 213-214           | 89               | Lacrimator              |
| 181. O-Cyan-benzyl chlorid                  |                       | Solid             | 252               | 60-61.5          | Irritant                |
| 182. M-cyan benzyl chlorid                  |                       | Solid             | 258-260           | 67               | Irritant                |
| 183. P-cyan benzyl chlorid                  |                       | Solid             | 263               | 79.5             | Irritant                |
| 184. O-cyan benzyl bromid                   |                       | Solid             | 155-157<br>(23mm) | 76               | Irritant                |
| 185. M-cyan benzyl bromid                   |                       | Solid             |                   | 95               | Irritant                |
| 186. P-cyan benzyl bromid                   |                       | Solid             |                   | 115              | Irritant                |
| 187. O-chlor methyl phenyl<br>iso cyanat    |                       | Liquid            | 104-107<br>(3mm)  |                  | Lacrimator,<br>irritant |
| 188. M-chlor methyl phenyl<br>iso cyanat    |                       | Liquid            | 115<br>(7mm)      |                  | Irritant,<br>lacrimator |
| 189. P-chlor methyl phenyl<br>iso cyanat    |                       |                   |                   |                  |                         |
| 190. O-xylyl-chlorid                        |                       | Liquid            | 197-199           |                  | Lacrimator              |



169. Toxic character

168.

168. Lethal dose (inhalation): At ct equals 5,000 none out of five marmots die: irritating effect is weak.

169. Lethal dose (inhalation): Dose out of two rabbits and three out of five marmots die at ct equals 5,000.

169. The vapor irritates the eyes and causes shedding of hair.

170.

170. Irritating effect is weak and lacrimatory effect is slight.

171. Intolerability limit: 3 mg/m<sup>3</sup>. Is a lacrimator it belongs to the 7th class.

174. Lacrimatory and irritating properties are great.

175.

175. Toxicity (inhalation): None out of five marmots dies at ct equals 2,000. One out of three rabbits dies at ct equals 15,000. Irritating effect is very weak and lethal effect by inhalation is also weak.

177.

177. Considerably weaker than chloroacetic phenone. Lethal effect by inhalation: No deaths at ct equals 15,000 (rabbit) and at equals 4,000 (marmot).

178. Fairly strong compared to methyl substances. At 4 mg/m<sup>3</sup> there is some lacrimation after two minutes.

180. Vapor strongly irritates the eyes.

181. Lethal dose (inhalation): Two out of five rabbits die at ct equals 4,000. Very little lacrimatory action, and toxicity is somewhat stronger than brom substance.

182. Lethal dose (inhalation): Three out of five rabbits die at ct equals 4,000.

183. Lethal dose (inhalation): Two out of five rabbits die at ct equals 5,000.

184. Lethal dose (inhalation): No rabbits die at ct equals 4,000.

185. Lethal dose (inhalation): No rabbits die at ct equals 4,000.

186. Lethal dose (inhalation): One out of five rabbits dies at ct equals 1,000.

187. Lethal effect by inhalation of this gas is weak. Irritating and lacrimatory action: This effect is extremely violent and compares with chloroacetic phenone.

188. Lethal effect by inhalation is fairly strong. Irritating and lacrimatory action: This effect is fairly strong and is somewhat stronger than that of chloroacetic phenone.

189.

190. Marmots: 1000 mg/m<sup>3</sup> for 10 min. No deaths.



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REGISTRY NUMBER

FORM NUMBER

11

|      | Structural<br>Formula  | Physical<br>State | Boiling<br>Point                     | Melting<br>Point | Physiological<br>Effect |
|------|------------------------|-------------------|--------------------------------------|------------------|-------------------------|
| 191. | M-xylyl-chlorid        | Liquid            | 196-198                              |                  | Lacrimator              |
| 192. | P-xylyl chlorid        | Liquid            | 200-202                              |                  | Lacrimator              |
| 193. | o.m.p-xylyl bromid     | Liquid            | 210-220                              |                  | Lacrimator              |
| 194. | O-xylyl bromid         | Solid             | 223-224                              | 210              | Lacrimator              |
| 195. | M-xylyl bromid         | Liquid            | 210-220<br>(some<br>resolu-<br>tion) | 35               | Lacrimator              |
| 196. | P-xylyl bromid         | Liquid            | 100<br>(10mm)                        | 35               | Lacrimator              |
| 197. | O-xylyl cyanid         | Liquid            | 244                                  |                  |                         |
| 198. | M-xylyl cyanid         | Liquid            | 240-241                              |                  |                         |
| 199. | P-xylyl cyanid         | Liquid            | 242-243                              |                  |                         |
| 200. | O-xylyl rhodanid       | Solid             |                                      | 18-18.5          | Lacrimator              |
| 201. | M-xylyl rhodanid       | Liquid            | 170                                  |                  | Lacrimator              |
| 202. | P-xylyl rhodanid       | Solid             |                                      | 21.5-<br>22.5    | Lacrimator              |
| 203. | O-xylylen bromid       | Solid             |                                      | 93               | Lacrimator              |
| 204. | M-xylylen bromid       | Solid             |                                      | 75               | Lacrimator              |
| 205. | P-xylylen bromid       | Solid             | 245                                  | 144              | Lacrimator.             |
| 206. | o.m.p. xylylen bromid  | Solid             |                                      |                  | Lacrimator              |
| 207. | P-xylylen cyanid       | Liquid            | 73.5-<br>74.5                        | 93               |                         |
| 209. | O-nitro benzyl chlorid | Solid             |                                      | 48               |                         |
| 210. | M-nitro benzyl chlorid | Solid             |                                      | 45-47            |                         |
| 211. | P-nitro benzyl chlorid | Solid             |                                      | 71               |                         |
| 212. | O-nitro benzyl bromid  | Solid             |                                      | 46-47            | Lacrimator              |
| 213. | M-nitro benzyl bromid  |                   |                                      |                  |                         |
| 214. | P-nitro benzyl bromid  | Solid             |                                      | 99-100           | Lacrimator              |
| 215. | P-nitro benzal bromid  | Solid             | 173-174                              | 82-82.5          |                         |
| 216. | 2-furfuryl chlorid     |                   |                                      |                  | Lacrimator              |
| 217. | 2-furfuryl bromid      |                   |                                      |                  | Lacrimator              |
| 218. | 2-furfuryl rhodanid    |                   |                                      |                  |                         |

No. Toxic character

- 191.
- 192.
193. Intolerability limit: 0.015 mg/L.
194. Refer to paragraph on three types of mixtures.
195. Refer to paragraph on three types of mixtures.
196. Refer to paragraph on three types of mixtures.
- 197.
- 198.
- 199.
200. Irritates the mucous membranes.
201. Irritates the mucous membranes.
202. Irritates the mucous membranes.
203. Lacrimatory effect is especially obvious and is about the same as that of known lacrimatory gases.
204. Estimated to have practically same toxic character as pure compound.
205. Lacrimatory effect is markedly weak compared to bromobenzyl. Lethal inhalation density for rabbits and marmosets is at least equal to 10,000.
206. Practically same as pure compound and lacrimatory and mucous membrane irritating actions are slightly stronger. Lethal density: at least over 10,000 for rabbits and marmosets.
- 207.
208. Lethal effect by inhalation is very weak. The lacrimatory effect is weak. It is inferior to known lacrimatory agents.
209. Toxicity of this gas is still when compared to known military gases. It is the same as C.M.P.
210. Refer to 2. Although the position of  $\text{NO}_2$  has changed, there is no change in toxic character.
211. Practically same as known lacrimator (benzyl bromide).
- 212.
213. Weak strongly irritating the mucous membranes of nose and eyes.
214. Has lacrimatory effects but is not stable.
215. Has lacrimatory effects but is unstable.
216. Has vesicant effects but is weak.



| No. | Comp.   | Structural formula | Physical state | Boiling point     | Melting point | Physiological effect |
|-----|---|--------------------|----------------|-------------------|---------------|----------------------|
| 219 | 2-chloro-2-phenyl ethylidene                  |                    |                |                   |               | Irritant             |
| 220 | 1-chloro methyl naphthalin                    |                    | Solid          |                   | 47            |                      |
| 221 | 2-cyan methyl naphthalin                      |                    | Solid          |                   | 31-32         | Irritant             |
| 222 | 4-chloro anisol                               |                    | Liquid         | 195-202           | -20           |                      |
| 223 | 2,4-dichloro anisol                           |                    | Liquid         | 220               | -10 -<br>-12  |                      |
| 224 | 2,4,6-trichloro anisol                        |                    | Liquid         | 228-232           | 5 - 8         |                      |
| 225 | 2,3,4,5-tetrachloro anisol                    |                    | Solid          |                   | 54            |                      |
| 226 | 2,3,4,5,6-pentachloro anisol                  |                    | Solid          |                   | 102           |                      |
| 227 | 0-chloro methyl anisol                        |                    | Liquid         | 210               |               |                      |
| 228 | P-chloro methyl anisol                        |                    | Liquid         | 120-130<br>(30mm) | Under<br>-40  |                      |
| 229 | 0-dichloro methyl anisol                      |                    | Liquid         | 235               |               |                      |
| 230 | P-dichloro methyl anisol                      |                    | Liquid         | 135-140<br>(50mm) | Under<br>-40  |                      |
| 231 | 0-trichloro methyl anisol                     |                    | Liquid         | 150<br>(30mm)     |               |                      |
| 232 | P-trichloro methyl anisol                     |                    | Liquid         | 150<br>(50mm)     | -40           |                      |
| 233 | 2-methyl 3,4,5,6-tetrachloro anisol           |                    | Solid          |                   | 103-110       |                      |
| 234 | 0-trichloro methyl 3,4,5,6-tetrachloro anisol |                    | Solid          |                   | 50            |                      |
| 235 | 2-methyl-6-chloro anisol                      |                    | Liquid         | 205               | 0-2           |                      |
| 236 | 2-methyl-4-chloro anisol                      |                    | Liquid         | 210               | 0-10          |                      |
| 237 | 2-methyl-4-6 dichloro anisol                  |                    | Liquid         | 140-144<br>(40mm) | 10-15         |                      |
| 238 | 2-methyl-3,4,5,6-tetrachloro anisol           |                    | Liquid         | 155-160<br>(14mm) | 2-7           |                      |

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## Toxic character

219. Upon contact with the skin, there is violent pain.
220. Irritating and lacrimatory actions are very weak. Effect is less than 1/6 that of chloroaceto phenone. Lethal effect by inhalation is weak.
221. Lethal effect by inhalation is weak. Irritating and lacrimatory actions are very weak.
222. )
223. ) Irritating and lacrimatory actions of these gases are very weak. Lethal effect by inhalation is also very weak. It is difficult to establish the superiority or inferiority of any of these five gases.
224. )
225. )
226. )
227. )
228. )
229. ) Irritating and lacrimatory actions and lethal effect by inhalation of these six gases is very weak.
230. )
231. )
232. )
233. Irritating and lacrimatory actions and lethal effect by inhalation are very weak.
234. Even irritating and lacrimatory actions and lethal effect by inhalation are very weak.
235. Lethal effect by inhalation and irritating and lacrimatory actions of this gas are very weak.
236. Lethal effect by inhalation and irritating and lacrimatory actions of this gas are very weak.
237. Lethal effect by inhalation and irritating and lacrimatory actions of this gas are very weak (weaker than the aforementioned chemicals listed).
238. Lethal effect by inhalation and irritating and lacrimatory actions of this gas are very weak. Resembles dichloro anisol.

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| No.  | Name   | Structural formula | Physical state | Boiling point | Melting point | Physiological effect      |
|------|--|--------------------|----------------|---------------|---------------|---------------------------|
| 239. | 2-nitro-4-chlor anisol                       |                    | Solid          |               | 97-98         |                           |
| 240. | 4-nitro-2-chlor anisol                       |                    | Solid          |               | 94            |                           |
| 241. | 2-nitro-4,6.-dichlor anisol                  |                    | Solid          |               | 44            |                           |
| 242. | 4-nitro-2,6-dichlor anisol                   |                    | Solid          |               | 97            |                           |
| 243. | Stickstoff wasserstoff                       |                    | Liquid         | 37            | -80           | Irritant                  |
| 244. | Cyan amid                                    |                    | Solid          |               | 40            | Systemic poison, irritant |
| 245. | Dichlor methyl amin                          |                    | Liquid         | 57-60         |               | Lacrimator                |
| 246. | N-dichlor methyl amin                        |                    | Liquid         | 58-60         |               | Irritant, lacrimator      |
| 247. | N-dichlor athyl amin                         |                    | Liquid         | 91            |               | Irritant                  |
| 248. | N-dibrom methyl amin                         |                    | Liquid         | 32 (18mm)     |               | Lacrimator                |
| 249. | N,N-dibrom athyl amin                        |                    | Liquid         |               |               | Lacrimator                |
| 250. | Cyan amideen saure amid                      |                    | Solid          |               | 60            |                           |
| 251. | N-ethyl carbinil saure chlorid               |                    | Solid          | 95-96         | 50-50         | Lacrimator                |
| 252. | N-monochlor- $\beta$ -chlor athyl amin       |                    | Liquid         |               |               | Irritant, lacrimator      |
| 253. | N-dichlor- $\beta$ -chlor athyl amin         |                    | Liquid         | 120           |               | Irritant, lacrimator      |
| 254. | $\beta\beta$ dichlor athyl amin hydrochlorid |                    | Solid          | 215-216       |               | Vesicant                  |
| 255. | Tri- $\beta$ -chlor athyl amin hydrochlorid  |                    | Solid          | 130-131       |               | Vesicant                  |
| 256. | Tri- $\beta$ -chlor athyl amin               |                    | Liquid         | 103-104       |               | Vesicant                  |
| 257. | N-monochlor methyl urethan                   |                    | Liquid         | 74-75 (20mm)  |               | Lung injur-ant            |
| 258. | N-dichlor methyl urethan                     |                    | Liquid         | 61-62 (18mm)  |               | Lung injur-ant            |
| 259. | N-monochlor athyl urethan                    |                    | Liquid         | 91-92 (20mm)  |               | Lung injur-ant            |

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## 10. Toxic character

239. Toxicity (inhalation): two out of five marmots die at ct equals 4,000. Inhalation and irritating and lacrimatory actions are weak.
240. Toxicity (inhalation): none out of five dies at ct equals 4,000 (marmot). Inhalation and irritating and lacrimatory actions are weak.
241. Toxicity (inhalation): three out of five marmots die at ct equals 4,000. Inhalation, irritating, and lacrimatory actions are weak.
242. Toxicity (inhalation): one out of five marmots dies at ct equals 4,000. Inhalation and irritating and lacrimatory actions are weak.
243. Irritates the mucous membranes, especially the mucous membrane of the nose.
244. Irritating effect is weak. One out of five marmots dies at ct equals 5,000.
245. Causes violent shedding of tears.
246. Toxicity (inhalation): at ct equals 5,000, irritating effect is strong and there is considerable shedding of tears.
247. Toxicity (inhalation): irritating effect is fairly strong at ct equals 5,000 (marmot).
248. Irritating and lacrimatory actions are considerably weaker than those of chlor aceto phenone.
- 249.
- 250.
251. Lethal effect by inhalation is stronger than that of chlor aceto phenone, but irritating and lacrimatory effects are much weaker.
252. Lethal dose (inhalation): ct equals over 10,000 (rabbit). 40 percent of marmots die at ct equals 3,000, 100 percent at 5,000. Toxic character of this gas is inferior to that of known gases.
253. Lethal dose (inhalation): 100 percent of marmots die at ct equals 5,000. For rabbits, at equals 7,000-30,000. Suffocative effect is inferior to that of known military gases, but irritating, lacrimatory, and vesicant effects are considerable. Character is inferior to that of known gases.
254. Toxicity (inhalation): marmots do not die at ct equals 2,500 - 5,000. Irritating and lacrimatory effects are difficult to recognize. No vesicant characteristic.
255. Toxic character is weak. Irritating is moderately lacrimatory. Character is weak of yperite which it resembles.
256. Injures the skin. Vesicant effect resembles that of yperite for rabbits, but it is acute and has little persistency.
257. Toxicity (inhalation): 33 percent of rabbits and 20 percent of marmots die at ct equals 15,000.
258. Toxicity (inhalation): 33 percent of rabbits and 20 percent of marmots die at ct equals 10,000.
259. Toxicity (inhalation): No rabbits or marmots die at ct equals 10,000.

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| No.  | Name                                      | Structural Formula | Physical state | Boiling point       | Melting point | Physiological effect                 |
|------|---|--------------------|----------------|---------------------|---------------|--------------------------------------|
| 260. | N-dichlor athyl urethan                   |                    | Liquid         | 33-37<br>(33mm)     |               | Lung injur-<br>ant                   |
| 261. | N-dichlor-β-chlor<br>athyl urethan        |                    | Solid          | 133-134             | 35-38         | Irritant,<br>Lacrimator,<br>vesicant |
| 262. | Chlor acetyl athyl<br>urethan             |                    | Solid          |                     | 126           | Systemic<br>poison                   |
| 263. | Dicyan diazid                             |                    | Solid          |                     | 205           | Systemic<br>poison                   |
| 264. | Nitroso methyl urethan                    |                    | Liquid         | 59-60<br>(12mm)     |               |                                      |
| 265. | Nitroso athyl urethan                     |                    | Liquid         | 70<br>(37mm)        |               | Vesicant                             |
| 266. | Di methyl amin-N-<br>sulfen saure chlorid |                    | Liquid         | 122.5-123<br>(70mm) |               | Irritant                             |
| 267. | Diathyl amin-N-sulfon<br>saure chlorid    |                    | Liquid         | 114-115<br>(15mm)   |               | Irritant                             |
| 268. | Chlor acetyl urea                         |                    | Crystal        |                     | 190-191       | Irritant                             |
| 269. | N-chlor chlor acetyl<br>urea              |                    | Crystal        |                     | 160-162       | Irritant                             |
| 270. | Dichlor acetyl urea                       |                    | Solid          |                     | 149-150       | Irritant                             |
| 271. | N-chlor chlor acet<br>amid                |                    | Solid          |                     | 68-69         | Irritant                             |
| 272. | Phenyl carbyl amin<br>dichlorid           |                    | Liquid         | 210                 |               | Lacrimator,<br>lung injur-<br>ant    |
| 273. | O-chlor phenyl carbyl<br>amin dichlorid   |                    | Liquid         | 115-120<br>(10mm)   |               | Lacrimator                           |
| 274. | N-chlor phenyl carbyl<br>amin dichlorid   |                    | Liquid         | 93-97<br>(2mm)      |               | Lacrimator                           |
| 275. | P-chlor phenyl carbyl<br>amin dichlorid   |                    | Liquid         | 238                 |               | Lacrimator                           |
| 276. | P-phenylen dicarbyl<br>amin dichlorid     |                    | Solid          |                     | 80            | Irritant,<br>lung injur-<br>ant      |
| 277. | O-tolyl carbyl amin<br>dichlorid          |                    | Liquid         | 214-215             |               | Lacrimator                           |
| 278. | N-tolyl carbyl amin<br>dichlorid          |                    | Liquid         | 199<br>(11mm)       | 48.5          | Lacrimator                           |

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## TOXIC CHARACTER

261. Toxicity (inhalation): 35 percent of rabbits and 20 percent of marmosets die at ct equals 5,000.
262. Lethal effect by inhalation is stronger than that of chloroform but weaker than phosgene. Approximately less than one third the effectiveness but is comparatively strong when used on rabbits.
263. Toxicity (inhalation): Rabbits, marmosets, and pigeons do not die at ct equals 2,200. Lethal effect by inhalation and irritating and lacrimatory effects are very weak.
264. Toxic character weaker than that of cyan acid.
265. Lethal doses (hypodermic injection): 10 mg/kg, none out of five died. Lethal doses (painting skin): 20 mg/kg none out of five died. Toxicity (inhalation): Hardly any changes detected on rabbits and marmosets at ct equals 5,000. Skin injury: markedly inferior to yperite.
266. Lethal doses (hypodermic injection): 10 mg/kg none out of five died (rabbit). Toxicity (inhalation): irritating effect strong at ct equals 5,000 (rabbit, marmot).
267. Irritating effect is weak.
268. Irritating and lacrimatory actions are weak.
269. Toxicity (inhalation): none out of five marmosets died at ct equals 5,000. Irritating and lacrimatory actions are weak.
270. Irritating and lacrimatory actions are weak.
271. Irritating and lacrimatory actions are very weak.
272. Lethal effect by inhalation: no marmosets die at ct equals under 10,000. Roughly half (67 percent) of marmosets die at ct equals 20,000. It does not have strong irritating effect on the eyes (Nakamoto).
273. Irritating effect on the eyes is weak in comparison with most chemical gases.
274. Toxicity (inhalation): 30 percent of marmosets and no rabbits die at ct equals 5,000.
275. Lethal effect by inhalation is inferior to that of phosgene on marmosets, but compares with phosgene when used on rabbits and pigeons.
276. Toxicity (inhalation): one out of five marmosets died at ct equals 5,000. Irritating effect is not strong.
- 277.



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| No.  | Name                                   | Structural formula | Physical state | Boiling point   | Melting point  | Physiological effect                |
|------|--|--------------------|----------------|-----------------|----------------|-------------------------------------|
| 288. | p-Tolyl carbonyl amin dichlorid        |                    | Liquid         | 225-226         |                | Lacrimator                          |
| 289. | o-chlor methyl carbonyl amin dichlorid |                    | Liquid         | 140-142 (6mm)   |                | Lacrimator                          |
| 290. | m-chlor methyl carbonyl amin dichlorid |                    | Liquid         | 112-113 (5mm)   |                | Lacrimator                          |
| 291. | p-chlor methyl carbonyl amin dichlorid |                    | Liquid         | 130-131 (6,5mm) |                | Lacrimator                          |
| 292. | Carbonyl saure chlorid                 |                    | Solid          | 53.6            |                | Lacrimator                          |
| 293. | Carbonyl saure bromid                  |                    | Solid          |                 | 67             | Lacrimator                          |
| 294. | Carbonyl saure cyanid                  |                    | Solid          |                 | 128 (re-solve) | Lacrimator, irritant, lung injurant |
| 295. | o-Tolyl amid ameis en saure chlorid    |                    | Solid          |                 | 204            | Lacrimator                          |
| 296. | m-Tolyl amid ameis en saure chlorid    |                    | Solid          |                 | 202            | Lacrimator                          |
| 297. | p-Tolyl amid ameis en saure chlorid    |                    | Solid          |                 | 90-91          | Lacrimator                          |
| 298. | o-Tolyl amid ameis en saure bromid     |                    | Solid          |                 | 193            | Lacrimator                          |
| 299. | m-Tolyl amid ameis en saure bromid     |                    |                |                 |                |                                     |
| 300. | p-Tolyl amid ameis en saure bromid     |                    |                |                 |                |                                     |
| 301. | m-Amino benzyl chlorid hydro chlorid   |                    | Solid          |                 |                | Lacrimator                          |
| 302. | o-Tolyl amid ameis en saure cyanid     |                    | Solid          |                 | 229            | Lacrimator                          |
| 303. | m-Tolyl amid ameis en saure cyanid     |                    | Solid          |                 | 215.5          | Lacrimator                          |
| 304. | chlor acet toloid                      |                    | Solid          |                 | 111-112        |                                     |
| 305. | n-ethyl carbazol                       |                    | Solid          | 192 (19mm)      | 87.33          | Irritant                            |
| 306. | chlor acetyl dipheny amin              |                    | Solid          |                 | 223            | Lacrimator, irritant                |
| 307. | 2-Di anisidin                          |                    | Solid          |                 |                | Irritant                            |
| 308. | 2-Di anisidin urea                     |                    | Solid          |                 |                | Irritant                            |
| 309. | 2-Di anisidin thio urea                |                    | Solid          |                 |                | Irritant                            |

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## Toxic Character

280.

Toxicity (inhalation): two out of five marmosets and one out of two rabbits die at a dose equals 5,000. Although irritation during inhalation is fairly strong, the gas cannot be used effectively as a simple substance.

281.

282.

Toxicity (inhalation): one out of two marmosets and one out of five rabbits die at a dose equals 5,000.

283.

Toxicity (inhalation): one out of five marmosets and none of two rabbits die at a dose equals 2,500. Although lethal effect by inhalation is weak, the irritating and lacrimatory effects equal those of chloroaceto phenone.

284.

Toxicity (inhalation): none out of five marmosets and none out of two rabbits die at a dose equals 5,000. Has strong lacrimatory and mucous membrane irritating effects. At high density there is considerable lacrimatory action but it is inferior to known military gases. Moreover, the gas is inferior to solid chloro compounds.

285.

Irritating and lacrimatory effects are strong, almost comparable to those of chloroaceto phenone. Fairly strong lethal effect by inhalation compared with that of phosgene when used on rabbits.

286.

Lethal effect by inhalation is very weak. Irritating and lacrimatory effects are considerably weaker than those of chloroaceto phenone.

287.

Lethal effect by inhalation is comparatively weak. Considerable weaker than phosgene. Irritating and lacrimatory actions are strong, almost comparable to those of chloroaceto phenone.

288.

289.

Toxicity (inhalation): none of five marmosets die at a dose equals 2,500. One of two rabbits die at a dose equals 10,000. Irritating and lacrimatory effects are weak.

290.

291.

292.

Hardly any lethal effect by inhalation. Irritating and lacrimatory actions hardly noticeable.

293.

Toxicity (inhalation): At a dose equals 1,100 one out of five dies. At a dose equals 2,200 two out of five die (marmoset). Irritating and lacrimatory actions are strong, but are slightly weaker than those of chloroaceto phenone.

294.

Irritating and lacrimatory actions are fairly strong but weaker than chloroaceto phenone. About the same as o-compounds. Lethal effect by inhalation is considerably weaker when compared to phosgene.

295.

Has sterminatory character.

296.

Lethal dose (inhalation): rabbits do not die at a dose equals 3,000. Irritating effect is comparatively weak.





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| No.   | Name  | Structural<br>Formula                            | Physical<br>state | Boiling<br>point            | Melting<br>point | Physiological<br>effect            |
|-------|---|--|-------------------|-----------------------------|------------------|------------------------------------|
| 201.  | 2 -Di anisidin sulfat                               |  | Solid             |                             |                  | Irritant                           |
| 202.  | 2 -Di anisidin oxalat                               |  | Solid             |                             |                  | Irritant                           |
| 203.  | 2 -Di anisidin hydro<br>chlorid                     |  | Solid             |                             |                  | Irritant                           |
| 204.  | 2 -Di anisidin allyl<br>amfol                       |  | Solid             |                             |                  | Irritant                           |
| 205.  | 2 -Di anisidin<br>diacetat                          |  | Solid             |                             |                  | Irritant                           |
| 206.  | Blau saure  |  | Liquid            | 36.5                        | -13              | Systemic<br>poison                 |
| 21a.  | Blau saure  | O 4:1  | Liquid            |                             | -22              | Systemic<br>poison                 |
| b.    | Mixture   | O H R 3:2  | "                 |                             | -24.2            | "                                  |
| c.    | methyl cyanid                                       | E A  | "                 |                             | -42              | "                                  |
| d.    | (acetamid) (anion/CH <sub>3</sub> CH)               | I T 1:1<br>N I<br>I O 2:5<br>K<br>G 1:4          | "                 |                             | -45              | "                                  |
| 212a. | Blau saure  | O HCN/O(CH <sub>2</sub> CL) <sub>2</sub> 5:1     | Liquid            |                             |                  | Systemic<br>poison                 |
| b.    | Mixture   | O HCN/O(CH <sub>2</sub> CL) <sub>2</sub> 5:2     | "                 |                             |                  | "                                  |
| c.    | Sym-Dichlor<br>dimethyl ather                       | I HCN/O(CH <sub>2</sub> CL) <sub>2</sub> 5:3     | "                 |                             |                  | "                                  |
| d.    | (HCN/O (CH <sub>2</sub> CL)<br>(CH <sub>2</sub> CL) | O HCN/O(CH <sub>2</sub> CL) <sub>2</sub> 5:4     | "                 |                             |                  | "                                  |
| e.    |   | H I T HCN/O(CH <sub>2</sub> CL) <sub>2</sub> 5:5 | "                 |                             |                  | "                                  |
| 5.    | Di-cyan   | O  | Gas               | -21.4                       | -34.4            | Systemic<br>poison                 |
| 207.  | Di-cyan sulfid                                      |  | Solid             | 30-40<br>(sublima-<br>tion) | 40-42            | Drug injur-<br>ious                |
| 10.   | Sym phosgen   |  |                   |                             |                  | Drug injur-<br>ious                |
| 6.    | Hydro cyan  |  | Gas               | 18.5                        | -7               | Systemic<br>poison,<br>lacrimation |
| 7.    | Di-cyan   |  | Solid             | 11.5                        | 22               | Systemic<br>poison,<br>irritant    |

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16a

Toxic character

Rabbits do not die at ct equals 1,500. No respiratory changes.

Rabbits do not die at ct equals 1,100. No respiratory changes.

Rabbits do not die at ct equals 1,500. No respiratory changes.

Rabbits do not die at ct equals 1,500. No respiratory changes.

Rabbits do not die at ct equals 1,500. No respiratory changes.

| Inhalation (ct)   | Marmot               | Rabbit                   | Boar                            | Dog                             |
|-------------------|----------------------|--------------------------|---------------------------------|---------------------------------|
| Mortality - total | 700<br>(640)         | 500<br>(440)             | 300<br>(275)                    | 300<br>(275)                    |
| mortality - half  | 300-400<br>(275-310) | under 300<br>(under 275) | under 300<br>200<br>(under 185) | under 300<br>200<br>(under 185) |

(t equals 5 minutes). Figures in ( ) denote analytical value(?).

|       |  |                                       |   |
|-------|--|---------------------------------------|---|
| 21a.  | <u>Toxic density</u><br>mg/m <sup>3</sup> equals 1,000<br>(rabbit) | <u>Inhalation time</u><br>(5 minutes) | Four out of four die within one minute, 50 seconds.     |
| b.    | <u>Toxic density</u><br>mg/m <sup>3</sup> equals 1,000<br>(rabbit) | (5 minutes)                           | Four out of four die within three minutes, 30 seconds.  |
| c.    | <u>Toxic density</u><br>mg/m <sup>3</sup> equals 1,100<br>(rabbit) | (5 minutes)                           | Three out of four die within four minutes, 30 seconds.  |
| d.    | <u>Toxic density</u><br>mg/m <sup>3</sup> equals 1,200<br>(rabbit) | (10 minutes)                          | Two out of four die within 10 minutes.                  |
| e.    | <u>Toxic density</u><br>mg/m <sup>3</sup> equals 2,500<br>(rabbit) | (5 minutes)                           | Three out of four die within three minutes, 30 seconds. |
| 112a. | <u>Toxic density</u><br>mg/m <sup>3</sup> equals 1,000<br>(rabbit) | <u>Inhalation time</u><br>(5 minutes) | Three out of three die within 2 minutes.                |
| b.    | <u>Toxic density</u><br>mg/m <sup>3</sup> equals 1,000<br>(rabbit) | (5 minutes)                           | Four out of four die within 5 minutes.                  |
| c.    | <u>Toxic density</u><br>mg/m <sup>3</sup> equals 1,000<br>(rabbit) | (5 minutes)                           | Two out of five die within 4 minutes.                   |
| d.    | <u>Toxic density</u><br>mg/m <sup>3</sup> equals 1,000<br>(rabbit) | (5 minutes)                           | Four out of four die within 5 minutes.                  |
| e.    | <u>Toxic density</u><br>mg/m <sup>3</sup> equals 1,000<br>(rabbit) | (5 minutes)                           | None out of four died.                                  |

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Toxic character

Toxic character is 1/5 that of cyanic acid.

Resolves easily. Lethal dose is difficult to know.

Same as above.

Intolerability limit: 0.06 mg/L. Toxicity (inhalation): All die at or equals 3,750 (mouse), 7,500 (rabbit), over 7,500 (marmoset) (1 equals 5 minutes).

Intolerability limit: 163 mg/m<sup>3</sup>. Toxicity (inhalation): One out of five marmosets dies within seven days at or equals 5,000.

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| Index | Structural<br>Formula                                     | Physical<br>state | Boiling<br>point      | Melting<br>point       | Physiological<br>effect         |
|-------|---|-------------------|-----------------------|------------------------|---------------------------------|
| 1.    |   | Solid             |                       | 146.5<br>(sublimation) | Systemic<br>poison,<br>irritant |
| 2.    |   | Liquid            | 81.6                  | -44.4                  | Systemic<br>poison,<br>irritant |
| 3.    |   | Liquid            | 97                    | -103.5                 | Systemic<br>poison,<br>irritant |
| 4.    |   | Solid             |                       | 98                     |                                 |
| 5.    | Propionitril) mole-<br>diphosgen ) cular<br>com-<br>pound | Solid             |                       | Approximately<br>200   |                                 |
| 6.    |   | Liquid            | 44-45                 | -136.4                 | Lacrimator                      |
| 7.    |   | Liquid            | 117.6                 | -111.9                 | Systemic<br>poison              |
| 8.    |   | Liquid            | 140                   |                        | Systemic<br>poison,<br>irritant |
| 9.    |   | Solid             | 212-220               | 29                     |                                 |
| 10.   |   | Liquid            | 126-127<br>(resolves) |                        | Systemic<br>poison,<br>irritant |
| 11.   |   | Liquid            | 148-150               |                        | Systemic<br>poison,<br>irritant |
| 12.   |   | Liquid            | 182-184               |                        | Systemic<br>poison,<br>irritant |
| 13.   |   | Liquid            | 112-113               | -23 -<br>-25           | Systemic<br>poison,<br>irritant |
| 14.   |   | Liquid            | 162-163               | -18 -<br>-20           | Systemic<br>poison,<br>irritant |
| 15.   |   | Liquid            | 83-84                 | -38 -<br>-40           | Systemic<br>poison,<br>irritant |
| 16.   |   | Liquid            | 174-176               |                        |                                 |

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- | No. | Toxic character  |
|-----|--|
| 11. | Toxic character inferior to cyanic acid.   |
| 20. | Toxicity (inhalation): Some out of two died at ct equals 15,000. Although this agent is toxic, its effect is weak.                                   |
| 42. | Toxicity is very weak. Little to choose between this agent and aceto nitril.   |
| 43. | Toxicity (inhalation): Some out of five marmots died at ct equals 3,200 to 4,400. Some out of two rabbits died at ct equals 10,000 to 15,000.        |
| 44. | Toxicity (inhalation): Rabbits do not die at ct equals 10,000 to 15,000.   |
| 45. |  |
| 57. | Symptoms same as for cyanic acid.  |
| 60. | Lethal dose (hypodermic injection): Two out of three rabbits die at 100 mg/kg.   |
| 35. |  |
| 24. | Toxicity (inhalation): Rabbits and marmots do not die at ct equals 5,000. Irritating action is weak.   |
| 36. | Toxicity (inhalation): Some out of five rabbits and one out of five marmots die at ct equals 5,000. Irritating action is strong.                     |
| 38. | Toxicity (inhalation): Some out of two rabbits and one out of five marmots die at ct equals 5,000. Irritating action is strong.                      |
| 27. | Toxicity (inhalation): Lethal dose is at equals over 10,000 for rabbits and marmots. Has lacrimatory character but weak.                             |
| 30. | Toxicity (inhalation): Lethal dose is at equals over 10,000 for rabbits and marmots. Lacrimatory effect is weaker than that of known military gases. |
| 37. | Toxicity (inhalation): Lethal dose is at equals over 10,000 for rabbits and marmots. Lacrimatory effect is weak.                                     |
| 48. |  |



RESTRICTED

|      | Chemical<br>formula                    | Physical<br>state | Boiling<br>point   | Melting<br>point | Physiological<br>effect                     |
|------|--|-------------------|--|------------------|---|
| 309. | Iso propyl cyanid                      | Liquid            | 107-108  |                  | Systemic<br>poison;<br>irritant             |
| 310. | $\Delta$ -chlor iso<br>butyro nitril   | Liquid            | 175  |                  | Lung injur-<br>ant                          |
| 311. | Iso butyl cyanid                       | Liquid            | 126-128  |                  | Systemic<br>poison,<br>irritant             |
| 314. | $\gamma$ -chlor croton<br>amide nitril | Liquid            | 73-73.5<br>(25mm)  |                  | Vesicant                                    |
| 324. | Formaldehyd<br>cyanhydrin              | Liquid            | 108<br>(16mm)  |                  | Systemic<br>poison                          |
| 324. | Acetaldehyd<br>cyanhydrin              | Liquid            | 102<br>(15mm)  | -22              |   |
| 328. | Dibrom acetaldehyd<br>cyanhydrin       | Liquid            | 110<br>(22mm)  |                  | Lung injur-<br>ant                          |
| 329. | Trichlor acetalde-<br>hyd cyanhydrin   | Solid             | 215-230  | 60-61            | Lung injur-<br>ant                          |
| 330. | Tribrom acetalde-<br>hyd cyanhydrin    | Solid             | 137-138<br>(15-16mm)                                       | 35-37            | Lung injur-<br>ant                          |
| 332. | Acrolein cyanhy-<br>drin               | Liquid            | 93-94<br>(17mm)  |                  |   |
| 337. | Aceton cyanhydrin                      | Liquid            | 82<br>(23mm)   | -19              | Systemic<br>poison                          |
| 338. | Monochlor aceton<br>cyanhydrin         | Liquid            | 110<br>(22mm)  |                  | Lung injur-<br>ant                          |
| 339. | Monobrom aceton<br>cyanhydrin          | Liquid            | Resolves<br>when<br>heated<br>at norm-<br>al pres-<br>sure |                  | Lacrimator                                  |
| 340. | Syn dichlor aceton<br>cyanhydrin       | Liquid            | Resolves   |                  | Lacrimator,<br>lung injur-<br>ant, vesicant |
| 341. | Syn dibrom aceton<br>cyanhydrin        | Liquid            | Resolves   |                  | Lacrimator,<br>vesicant                     |
| 342. | $\Delta$ -dichlor-aceton<br>cyanhydrin | Liquid            |  |                  | Lacrimator,<br>lung injur-<br>ant, vesicant |
| 343. | $\Delta$ -dibrom aceton<br>cyanhydrin  | Liquid            |  |                  |   |

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80. Toxic character

800. Toxicity (inhalation): at ct equals 5,000, irritating effect is weak on rabbits, marmosets, mice, and rats. None out of two rabbits, none out of three mice, one out of three marmosets, and none out of three rats die.
810. Toxicity (inhalation): marmosets do not die at ct equals 5,000. Irritating action is weak.
811. Toxicity (inhalation): Irritating action is weak at ct equals 5,000 (rabbit, marmot).
812. Toxicity (inhalation): 30 per cent die at ct equals 3,000 (marmot). Lethal dose is at equals over 5,000. Vesicant action is extremely weak.
- 813.
- 814.
- 815.
816. Toxicity (inhalation): at ct equals 5,000, rabbits and marmosets do not die within a seven-day period.
820. Toxicity (inhalation): at ct equals 5,000, respiratory paralysis effect is fairly strong (rabbit, marmot).
- 821.
822. Symptoms exactly same as for cyanic acid.
823. Toxicity (inhalation): Marmosets do not die at ct equals 5,000.
824. Toxicity (inhalation): One out of three marmosets and none out of three pigeons die at ct equals 2,500. Irritating and lacrimatory actions weak. Do not compare with chloracetic phenomena. Lethal effect by inhalation is weak.
825. Lethal dose (inhalation): One out of two marmosets and none out of two rabbits die at ct equals 2,500.
826. Toxicity (inhalation): One out of five dies at ct equals 2,300. None out of five dies at 4,400 (marmot). None out of two rabbits dies at 15,000. Irritating and lacrimatory actions weak.
827. Lethal dose (inhalation): Two out of three marmosets and none out of two rabbits die at ct equals 5,000. Skin damaging action is fairly strong.
828. Lethal dose (inhalation): Three out of five marmosets die at ct equals 2,500 and 4,400. None out of two rabbits dies at equals 10,000 and 15,000. Lethal effect by inhalation is fairly strong and compares with phosgene when used on marmosets, but is markedly inferior when used on rabbits.

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| No.  | Name                             | Structural formula | Physical state | Boiling point   | Melting point | Physiological effect                 |
|------|----------------------------------|--------------------|----------------|-----------------|---------------|--------------------------------------|
| 324. | ddt-Trichlor acetone cyanhydrin  |                    | Liquid         |                 |               | Lacrimator, lung injur-ant, vesicant |
| 325. | ddt-Tribrom acetone cyanhydrin   |                    | Liquid         | Resolves        |               | Lacrimator, vesicant                 |
| 326. | ddt-Tribrom acetone cyanhydrin   |                    | Solid          | 123-126 (5mm)   | 53            | Lacrimator, irritant                 |
| 327. | ddt-Tribrom acetone cyanhydrin   |                    |                |                 |               |                                      |
| 328. | ddt-Tribrom acetone cyanhydrin   |                    | Solid          | Resolves 114    |               | Lacrimator, vesicant, poison         |
| 329. | Sym-Tetrabrom acetone cyanhydrin |                    |                |                 |               |                                      |
| 69.  | Cyan acetyl bromid               |                    | Solid          |                 | 145           |                                      |
| 70.  | Trichlor acetyl cyanid           |                    | Liquid         | 121-123         |               | Systemic poison                      |
| 126. | Monocyan methyl ether            |                    | Liquid         | 120             |               | Systemic poison, irritant            |
| 147. | Cyan methyl ethyl ether          |                    | Liquid         | 136             |               |                                      |
| 81.  | Monocyan essigsaur               |                    | Liquid         |                 |               |                                      |
| 78.  | Cyan ameisensaure methyl         |                    | Liquid         | 96.5            |               | Lung injur-ant                       |
| 93.  | Cyan ameisensaure athyl          |                    | Liquid         | 115             |               | Lung injur-ant                       |
| 100. | Monocyan essigsaur athyl         |                    | Liquid         | 207             |               | Systemic poison                      |
| 124. | Cyan acetaldehyd                 |                    | Liquid         | 71.5            | -20           |                                      |
| 221. | Y-chlor-N-nitrosylro nitro       |                    | Liquid         | 109-120 (7-8mm) |               | Systemic poison                      |
| 244. | Cyan amid                        |                    | Solid          |                 | 40            | Systemic poison, irritant            |
| 230. | Cyan ameisensaure                |                    | Solid          |                 | 60            |                                      |
| 233. | Dicyan diamid                    |                    | Solid          |                 | 126           | Systemic poison                      |
| 232. | Dichlor nitro acetonnitrite      |                    | Liquid         | 39 (21mm)       |               | Irritant                             |

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No. Toxic character

324. Lethal dose (inhalation): Two out of three marmots and none out of two rabbits die at ct equals 5,000. Skin damaging action is fairly strong.
325. Toxicity (inhalation): None out of five marmots dies at ct equals 2,200 and 4,400. Irritating and lacrimatory actions weak. Lethal effect by inhalation: Much weaker than phosgene.
326. Toxicity (inhalation): None out of five marmots and none out of two rabbits die at ct equals 5,000. Irritating symptoms weak.
- 327.
328. Toxicity (inhalation): None out of three marmots dies at ct equals 1,100 and 2,200. Irritating and lacrimatory actions: weak, greatly inferior to chlor aceto phenone.
- 329.
- 330.
331. Toxicity (inhalation): Marmots do not die even at ct equals 20,000. Toxic character is about 1/10 that of cyanic acid.
332. Toxicity (inhalation): at ct equals 5,000, irritating action is fairly strong (rabbit, marmot).
- 333.
- 334.
335. No irritating effect. Possesses effects similar to cyanic acid.
336. Its effect is exactly the same as for methyl ether on animal experiments. Its toxic character is somewhat weaker.
337. Toxicity (inhalation): at ct equals 5,000, hardly any changes noticed in rabbits and marmots.
- 338.
339. Toxicity (inhalation): One out of five marmots dies at ct equals 5,000 and 10,000. Irritating symptoms weak.
340. Toxicity (inhalation): One out of five marmots dies at ct equals 8,000. Irritating action weak.
- 341.
342. Toxic character inferior to cyan acid.
343. Toxicity (inhalation): Irritating action is weak on rabbits and marmots at ct equals 5,000.

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(Classification Stamp)  
 DISSEMINATION FORM FOR ID TYPING

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| No. | Name                           | Structural formula | Physical state | Boiling point   | Melting point    | Effect                    |
|-----|--------------------------------|--------------------|----------------|-----------------|------------------|---------------------------|
| 336 | Dibrom nitro aceto nitril      |                    | Liquid         | 57-58 (12mm)    | Approximately 30 | Irritant                  |
| 337 | Athyl iso cyanid               |                    | Liquid         | 78-79           | -54              | Systemic poison, irritant |
| 338 | Allyl cyanid                   |                    | Liquid         | 117.4           |                  | Systemic poison           |
| 339 | Brom iso butyl hydroxy cyanid  |                    | Liquid         | 109-109 (135mm) |                  | Lacrimator                |
| 340 | Methyl iso cyanat              |                    | Liquid         | 40-45           |                  | Lacrimator                |
| 341 | Aethyl iso cyanat              |                    | Liquid         | 60              |                  | Lacrimator                |
| 342 | Rhodan wasserstoff             |                    | Liquid         | -12.5           |                  | Systemic poison           |
| 343 | Calcium                        |                    | Solid          |                 |                  | Systemic poison           |
| 344 | Thiocyl rhodanid               |                    | Solid          |                 |                  |                           |
| 345 | Methylen rhodanid              |                    | Solid          |                 | 102              | Irritant                  |
| 346 | Aethylen rhodanid              |                    | Solid          |                 | 90               | Irritant                  |
| 347 | Methyl rhodanid                |                    | Liquid         | 130-135         | -51              | Systemic poison           |
| 348 | Chlor methyl rhodanid          |                    | Solid          | 260-263         | 67               |                           |
| 349 | Dichlor methyl rhodanid        |                    |                |                 |                  |                           |
| 350 | Trichlor methyl rhodanid       |                    |                |                 |                  |                           |
| 351 | Aethyl rhodanid                |                    | Liquid         | 141-142         |                  | Systemic poison           |
| 352 | $\beta$ -chlor athyl cyanid    |                    | Liquid         | 176-178         |                  |                           |
| 353 | Allyl rhodanid                 |                    | Liquid         | 148             |                  | Systemic poison           |
| 354 | Propyl rhodanid                |                    | Liquid         | 163             |                  |                           |
| 355 | Rhodan essigsäure methyl ester |                    | Liquid         |                 |                  |                           |

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(Classification Stamp)





|      | Structural<br>Formula                  | Physical<br>State | Boiling<br>point       | Melting<br>point | Physiological<br>action    |
|------|--|-------------------|------------------------|------------------|----------------------------|
|      | Methyl isothio cyanat                  | Liquid            | 146-147                |                  |                            |
| 57.  | Ethyl isothio cyanat                   | Liquid            | 129                    |                  | Anesthetic,                |
| 58.  | Allyl isothio cyanat                   | Liquid            | 148.2                  | -80              |                            |
| 59.  | Propyl isothio cyanat                  | Liquid            | 156                    |                  | Excitant                   |
| 60.  | Acetyl isothio cyanat                  | Liquid            | 178-180                |                  |                            |
| 73.  | Propionyl isothio                      | Liquid            | 146-149                |                  |                            |
| 138. | Monoisothio cyan<br>dimethyl ether     | Liquid            | 138<br>56-60<br>(30mm) |                  | Systemic<br>poison         |
| 141. | Dye-diisothio cyan                     | Solid             | 140-142                | 16.7             | Excitant,<br>lung irritant |
| 142. | Monoisothio cyan methyl<br>ethyl ether | Liquid            | 94-95<br>(97mm)        |                  |                            |
| 343. | 1,5-dibrom propyl<br>isothio cyanat    | Liquid            |                        |                  |                            |
| 159. | Benzonitril                            | Liquid            | 190.7                  | -121.9           |                            |
| 345. | o-nitro benzonitril                    | Solid             |                        | 109              | Systemic                   |
| 346. | m-nitro benzonitril                    | Solid             |                        | 117-118          | Systemic<br>poison         |
| 347. | p-nitro benzonitril                    | Solid             |                        | 146-149          | Systemic                   |
| 348. | o-tolunitril                           | Liquid            | 205                    | -12              |                            |
| 349. | m-tolunitril                           | Liquid            | 212-214                | -23.5            | Systemic                   |
| 350. | p-tolunitril                           | Solid             | 216                    | 28               | Systemic                   |
| 161. | o-cyan benzyl chlorid                  | Solid             | 252                    | 60-61.5          |                            |
| 162. | m-cyan benzyl chlorid                  | Solid             |                        | 59               |                            |
| 163. | p-cyan benzyl chlorid                  | Solid             | 263                    | 79.5             | Excitant                   |
| 164. | o-cyan benzyl bromid                   | Solid             | 155-157                | 76               |                            |

Toxicity (inhalation): Rabbits and marmots do not die at ct equals 5,000. Irritating action is weak.

Toxicity (inhalation): Strongly irritates rabbits and marmots at ct equals 3,000. Considerable driving and tear shedding.

Toxicity (inhalation): Irritating effect on marmots is weak at ct equals 5,000.

Toxicity (inhalation): One out of five marmots dies at ct equals 500 and 1,000. Irritating and lacrimatory actions are markedly weaker than those of chloroacetophenone.

Toxicity (inhalation): None out of five rabbits and marmots die at ct equals 5,000. Irritating action is weak.

Toxicity (inhalation): Rabbits and marmots do not die at ct equals 5,000. Irritating action is weak.

Toxicity (inhalation): 20 percent of marmots die at ct equals 5,000.

Toxicity (inhalation): Rabbits and marmots do not die at ct equals 5,000. Irritating action is comparatively strong.

Toxicity (inhalation): Irritating action is fairly strong at ct equals 5,000 (rabbit, marmot).

Toxicity (inhalation): Marmots and rabbits do not die at ct equals 5,000 and 10,000. Lacrimatory action: Less than one-fifth as effective as chloroacetophenone.

Toxicity (inhalation): Slight irritating action at ct equals 10,000 (rabbit, marmot). Lethal effect by inhalation is ct equals over 5,000 for rabbits.

Lethal dose (inhalation): ct equals over 5,000. Irritating action not detected.

Lethal dose (inhalation): ct equals over 5,000. Irritating action not detected.

Irritating action not detected. Rated inferior in some characteristics to military gases.

Has one-third to one-half the toxic character of  $C_6H_5ON$ .

Lethal dose (inhalation): Two out of five rabbits die at ct equals 4,000. Irritating action is weak.

Lethal dose (inhalation): Three out of five marmots die at ct equals 4,000. Irritating action is weak.

Lethal dose (inhalation): Two out of five rabbits die at ct equals 4,000. Irritating action is weak.

Lethal dose (inhalation): Rabbits do not die at ct equals 4,000. Irritating action is weak.

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DISSEMINATION FORM FOR ID TRANSLATIONS



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| No.  | Name                             | Structural<br>formula | Physical<br>state | Boiling<br>point | Melting<br>point  | Physiological<br>effect                        |
|------|----------------------------------|-----------------------|-------------------|------------------|-------------------|--|
|      |                                  |                       |                   |                  |                   |  |
| 185. | m-cyan benzyl bromid             |                       | Solid             |                  | 95                | Irritant                                       |
| 186. | p-cyan benzyl bromid             |                       | Solid             |                  | 115               | Irritant                                       |
| 187. | m-cyan benzyl cyanid             |                       | Liquid            | 240              |                   |  |
| 188. | Benzyl cyanid                    |                       | Liquid            | 220-221          |                   |  |
| 189. | Benzyl selen cyanid              |                       | Solid             |                  | 71.5              |  |
| 191. | Chlorbenzyl cyanid               |                       | Liquid            | 229              | 33-35             | Lacrimator                                     |
| 197. | o-xyllyl cyanid                  |                       | Liquid            | 244              |                   |  |
| 198. | m-xyllyl cyanid                  |                       | Liquid            | 240-241          |                   |  |
| 199. | p-xyllyl cyanid                  |                       | Liquid            | 242-243          |                   |  |
| 207. | propylisocyanid                  |                       | Liquid            | 73.5-<br>74.5    | 9.3               |  |
| 253. | Cyan acetophenon                 |                       | Solid             |                  | 80-81             | Lacrimator,<br>irritant                        |
| 254. | Chlor cyan acetophenon           |                       | Solid             |                  | 170-172           | Lacrimator,<br>irritant                        |
| 255. | Brom-cyan acetophenon            |                       | Solid             |                  | 123               | Lacrimator,<br>irritant                        |
| 256. | m-jod-cyan acetophenon           |                       |                   |                  |                   |  |
| 285. | Carbonylsäure cyanid             |                       | Solid             |                  | 128<br>(resolves) | Lacrimator,<br>irritant,<br>systemic<br>poison |
| 293. | o-tolyl amid ameisensäure cyanid |                       | Solid             |                  | 229               | Lacrimator                                     |
| 294. | m-tolyl-amid ameisensäure cyanid |                       | Solid             |                  | 215.5             | Lacrimator                                     |
| 357. | p-tolyl amid ameisensäure cyanid |                       |                   |                  |                   |  |
| 358. | Cyclohexyl hydroxy cyanid        |                       | Solid             |                  | 37                | Systemic<br>poison                             |
| 221. | β-cyan methyl naphthalin         |                       | Solid             |                  | 81-82             | Irritant                                       |
| 389. | Phenyl iso nitril                |                       | Liquid            | 75-78            | < -66             | Systemic<br>poison                             |
| 380. | Phenyl carbyl amin<br>dibromid   |                       | Solid             | 145-147          | 52-55             | Lacrimator                                     |
| 292. | Phenyl carbyl amin<br>dibromid   |                       | Liquid            | 210              |                   | Lacrimator,<br>lung damage                     |

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## No. Toxic character

185. Lethal dose (inhalation): Rabbits do not die at ct equals 4,000. Irritating action is weak.

186. Lethal dose (inhalation): One out of five marmots die at ct equals 4,000. Irritating action is weak.

187.

188.

189.

190. Toxicity (inhalation): Irritating action is weak at ct equals 2,000 (marmot).

191.

192.

193.

194.

195. Toxicity (inhalation): Rabbits and marmots do not die in a seven-day period at ct equals 5,000. Irritating action is weak.

196.

197.

Causes sneezing.

198.

199. Lethal dose (inhalation): Three out of five die at ct equals 1,100. Two out of five die at 2,200 (marmot). Irritating and lacrimatory actions are fairly strong and almost comparable with chlor aceto phenone. Lethal effect by inhalation is fairly strong. Compares with phosgene when used on marmots.

200. Toxicity (inhalation): One out of five dies at ct equals 1,100 and two out of five at 2,200 (marmot). Rabbits do not die at ct equals 5,000 to 10,000. Irritating and lacrimatory actions are strong. However, slightly inferior to chlor aceto phenone. Lethal effect by inhalation is somewhat weaker than phosgene.

201. Toxicity (inhalation): One out of five dies at ct equals 1,100 and two out of five at 2,200 (marmot). Rabbits do not die at ct equals 5,000 to 10,000. Irritating and lacrimatory actions are fairly strong but weaker than chlor aceto phenone. About the same as o-compounds. Lethal effect by inhalation is much weaker than that of phosgene.

202.

203. Rabbits die of poisoning: Two out of two at 20 mg; one out of three at 10 mg; none out of three at 5 mg.

204.

Lethal effect by inhalation is weak. Irritating and lacrimatory actions are very weak.

205. Toxicity (inhalation): None out of three die at ct equals 5,000 and 10,000 (marmot). Lacrimatory action does not compare with that of chlor aceto phenone.



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Strongly irritates the eyes.

Lethal dose (inhalation): Marmots do not die at ct equals under 10,000. Approximately one-half (67 percent) die at ct equals 20,000. Irritating action is not strong.

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REGISTRY NUMBER

CLASS NUMBER

| No. | Name   | Structural<br>formula | Physical<br>state | Boiling<br>point      | Melting<br>point | Physiological<br>effects |
|-----|--|-----------------------|-------------------|-----------------------|------------------|--------------------------|
| 177 | o-chlor phenyl carbyl<br>amin dichlorid        |                       | Liquid            | 115-120<br>(18mm)     |                  | Lacrimator               |
| 178 | m-chlor phenyl carbyl<br>amin dichlorid        |                       | Liquid            | 93-97<br>(2mm)        |                  | Lacrimator               |
| 179 | p-chlor phenyl carbyl<br>amin dichlorid        |                       | Liquid            | 230                   |                  | Lacrimator               |
| 180 | o-tolyl carbyl amin<br>dichlorid               |                       | Liquid            | 214-215               |                  | Lacrimator               |
| 181 | m-tolyl carbyl amin<br>dichlorid               |                       | Liquid            | 199<br>(11mm)         |                  | Lacrimator               |
| 182 | p-tolyl carbyl amin<br>dichlorid               |                       | Liquid            | 225-226               |                  | Lacrimator               |
| 183 | o-chlor methyl phenyl<br>carbyl amin dichlorid |                       | Liquid            | 140-142<br>(6mm)      |                  | Lacrimator               |
| 184 | m-chlor methyl phenyl<br>carbyl amin dichlorid |                       | Liquid            | 112-113<br>(6mm)      |                  | Lacrimator               |
| 185 | p-chlor methyl phenyl<br>carbyl amin dichlorid |                       | Liquid            | 130-131<br>(615mm)    |                  | Lacrimator               |
| 186 | Benzyl iso cyanid                              |                       | Liquid            | 220-221               |                  |                          |
| 187 | Phenyl iso cyanat                              |                       | Liquid            | 157-158               |                  | Irritant                 |
| 188 | o-tolyl iso cyanat                             |                       | Liquid            | 182-183               |                  | Irritant,<br>lacrimator  |
| 189 | m-tolyl iso cyanat                             |                       | Liquid            | 161-164               |                  | Irritant,<br>lacrimator  |
| 190 | p-tolyl iso cyanat                             |                       | Liquid            |                       |                  | Irritant,<br>lacrimator  |
| 191 | m-nitro phenyl iso<br>cyanat                   |                       | Solid             |                       |                  | Lacrimator               |
| 192 | o-chlor methyl<br>phenyl iso cyanat            |                       | Liquid            | 104-107<br>(2mm)      |                  | Irritant,<br>lacrimator  |
| 193 | m-chlor methyl<br>phenyl iso cyanat            |                       | Liquid            | 115<br>(7mm)          |                  | Irritant,<br>lacrimator  |
| 194 | Benzyl rhodanid                                |                       | Liquid            | 220-225<br>(resolves) | 41               | Systemic<br>poison       |
| 195 | o-xylyl rhodanid                               |                       | Solid             |                       | 16-<br>17.6      | Lacrimator               |
| 196 | m-xylyl rhodanid                               |                       | Liquid            | 170                   |                  | Lacrimator               |
| 197 | p-xylyl rhodanid                               |                       | Solid             |                       | 11.5-<br>22.5    | Lacrimator               |

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| No.  | Name                               | Structural<br>formula | Physical<br>state | Boiling<br>point       | Melting<br>point | Physiological<br>effect |
|------|------------------------------------|-----------------------|-------------------|------------------------|------------------|-------------------------|
| 366. | Benzyl senfol                      |                       | Liquid            | 221                    | -21              |                         |
| 367. | Benzyl isothio cyanat              |                       | Liquid            | 243                    |                  | Irritant                |
| 368. | o-chlor phenyl iso-<br>thio cyanat |                       | Liquid            | 248                    |                  | Irritant                |
| 369. | m-chlor phenyl iso-<br>thio cyanat |                       | Liquid            | 130-131                |                  | Irritant                |
| 370. | p-phenylen dithio<br>carbonyl amin |                       | Solid             |                        | 130              | Irritant                |
| 371. | Aceton                             |                       | Liquid            | 56                     | -94              | Irritant,<br>anesthetic |
| 372. | Methyl vinyl keton                 |                       | Liquid            | 34<br>(130mm)          |                  | Irritant                |
| 373. | Monochlor acetone                  |                       | Liquid            | 119                    |                  | Lacrimator              |
| 374. | Monobrom acetone                   |                       | Liquid            | Re-<br>solves          |                  | Irritant,<br>lacrimator |
| 375. | Moniod acetone                     |                       | Liquid            | 58.4<br>(11mm)         |                  | Lacrimator              |
| 376. | Monochloroacetone                  |                       | Liquid            | 73.5-<br>74.5<br>(1mm) |                  |                         |
| 377. | Sym-dichlor acetone                |                       | Solid             | 75<br>(10mm)           | 43               | Lacrimator              |
| 378. | Sym-dibrom acetone                 |                       | Solid             | 107<br>(10mm)          | 28.3             | Lacrimator              |

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## No. Toxic character

187. Lethal dose (inhalation): None out of two rabbits and none out of five marmosets die at ct equals 5,000. Irritating action is weak.
368. Toxicity (inhalation): One out of five marmosets and none out of two rabbits die at ct equals 2,000.
369. Toxicity (inhalation): Two out of five marmosets and none out of two rabbits die at ct equals 2,000.
370. Toxicity (inhalation): One out of five marmosets and none out of three rabbits die at ct equals 3,000. Very weak compared with known military gases.
371. Toxicity (inhalation): One out of five marmosets dies within seven days at ct equals 5,000. Intolerability limit: 100 mg/c<sup>3</sup>.
372. Toxicity (inhalation): Marmosets do not die at ct equals 1,100 and 2,200. Irritating and lacrimatory actions are fairly strong, but weaker than those of chlor aceto phenone.
373. Although irritating action is inferior when for chlor acetone, the toxic effect is superior.
- 374.
375. Toxicity (inhalation): One out of five marmosets died at ct equals 1,100 and one out of five at 2,200. One out of two rabbits dies at ct equals 5,000 and none out of two at 10,000. Lethal effect by inhalation is fairly strong, but considerably weaker than for phosgene. Irritating and lacrimatory actions are fairly strong and almost compare with those of chlor aceto phenone.
376. Toxicity (inhalation): None out of three marmosets dies at ct equals 1,100 and one out of three dies at 2,200. Irritating and lacrimatory actions are violent and persistent. Effects are superior to those of chlor aceto phenone.

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## No. Toxic character

377. Toxicity (inhalation): One out of five marmots dies at ct equals 2,000 and two out of five die at 5,000. None out of two rabbits dies at ct equals 2,000 and at 5,000. Hardly any lacrimatory action. Suffocative effect is very weak.
378. Lethal dose (inhalation): None out of five marmots dies at ct equals 4,400. Two out of two rabbits die at ct equals 15,000. Irritating and lacrimatory actions resemble those of Sym-dichlor acetone.
379. Toxicity (inhalation): One out of five dies at ct equals 2,000. None out of five dies at 5,000 (marmot). Lacrimatory and sneezing effects from hypodermic injection are fairly strong, but both are weaker than for known military gases.
380. Lethal dose (inhalation): One out of five dies at ct equals 1,100, none out of five at 2,200, and one out five at 4,400 (marmot). Irritating and lacrimatory actions are somewhat weaker than those of ~~chloroform~~.
381. Lethal dose (inhalation): One out of five dies at ct equals 5,000 (marmot). Irritating and lacrimatory actions are weak.
- 382.
383. Toxicity (inhalation): Pigeons and marmots do not die at ct equals 500, 1,100, and 2,200. Irritating and lacrimatory actions: Much weaker than chloroform and related compounds.
384. Lethal dose (inhalation): Two out of five die at 2,200 and three out of five at 4,400 (marmot). Irritating and lacrimatory actions: Somewhat stronger than chloroform groups but weaker than dichlor and dibrom groups.
385. Toxicity (inhalation): None out of five dies at ct equals 2,000 and two out of five at 5,000 and at 10,000 (marmot). Vesicant effect: Resembles yperite.
386. Toxicity (inhalation): None out of five marmots dies at ct equals 2,200 and at 4,400. Irritating and lacrimatory actions: Same as Sym-dichlor acetone. Vesicant effect is fairly strong but weaker than yperite.
387. Toxicity (inhalation): One out of three dies at ct equals 500 and none out of five dies at 2,000 and at 5,000 (marmot). Lacrimatory effect: Somewhat weaker than known lacrimatory agents.
388. Resembles methyl ketone but weaker.
389. Toxicity (inhalation): ct equals 4,400 (marmot). ct equals 10,000 (rabbit) no deaths. Irritating and lacrimatory actions are weak.
390. Possesses strong irritating and lacrimatory actions.
391. Toxicity (inhalation): Marmots do not die at ct equals 2,200 and at 4,400. Irritating and lacrimatory actions are weak.
- Physiological effect is not unlike that of brom acetone.



| No.  | Name                              | Structural<br>Formula | Physical<br>state | Boiling<br>point                     | Melting<br>point | Physiological<br>effect           |
|------|-----------------------------------|-----------------------|-------------------|--------------------------------------|------------------|-----------------------------------|
| 394. | $\Delta$ -brom diethyl<br>keton   |                       | Liquid            | 157-158                              |                  | Toxicant                          |
| 395. | $\Delta$ -dibrom diethyl<br>keton |                       | "                 | 193-195                              |                  |                                   |
| 396. | Brom methyl iso<br>propyl keton   |                       |                   |                                      |                  |                                   |
| 397. | Dibrom methyl iso<br>propyl keton |                       |                   |                                      |                  |                                   |
| 398. | Dichlor pinakolin                 |                       | Solid             |                                      | 51               | Lacrimator                        |
| 399. | Dibrom pinakolin                  |                       | Solid             |                                      | 75-76            | "                                 |
| 400. | W-brom pinakolin                  |                       | Liquid            | 184-188<br>(some<br>reso-<br>lution) |                  | Lacrimator,<br>irritant           |
| 401. | Trichlor chloral<br>acetone       |                       | Solid             | 155-162<br>(7-8mm)                   | 83.5             | Systemic<br>poison,<br>anesthetic |
| 402. | Sym-dibrom diacetyl               |                       | Solid             |                                      | 106-107          |                                   |
| 403. | Sym-tetrachlor<br>diacetyl        |                       | "                 | 204-206                              | 82-84            | Vesicant                          |
| 404. | Sym-tetrabrom<br>diacetyl         |                       | "                 |                                      | 95-96            | Lacrimator                        |
| 405. | Acetoximino acetyl<br>cyanid      |                       | "                 |                                      | 90               | Systemic<br>poison                |
| 406. | Aceto phenon                      |                       | "                 | 202                                  | 20               |                                   |
| 407. | Chlor aceto phenon                |                       | "                 | 245-247                              | 58-59            | Lacrimator                        |
| 408. | Brom aceto phenon                 |                       | "                 | 135<br>(18mm)                        | 50               | Lacrimator                        |
| 409. | Jod aceto phenon                  |                       | "                 | 150<br>(15mm)                        | 30               | "                                 |
| 353. | Cyan aceto phenon                 |                       | "                 |                                      | 80-81            | Irritant,<br>lacrimator           |
| 410. | Dibrom aceto phenon               |                       | "                 |                                      | 36-37            |                                   |
| 411. | Chlor cyan aceto<br>phenon        |                       | "                 |                                      | 170-171          | Stomachator                       |
| 412. | Brom cyan aceto<br>phenon         |                       | "                 |                                      | 123              | "                                 |
| 413. | Jod cyan aceto                    |                       |                   |                                      |                  |                                   |

36. Toxic character

394. Has strong irritating odor

Irritating and lacrimatory actions are fairly strong, but much weaker compared with chlor aceto phenone and dibrom pinakolin. Lethal effect by inhalation does not compare with phosgene.

Irritating and lacrimatory actions are stronger than those of chlor aceto phenone. The gas is persistent. Lethal effect by inhalation is weak.

400. Strongly attacks the skin and eyes.

401. Lethal dose (inhalation): Two out of five die at  $ct$  equals 2,000 and five out of five at 5,000 (marmot). Lethal effect by inhalation is fairly strong, but the agent has hardly any lacrimatory effect.

403. Lethal dose (inhalation): One out of five dies at  $ct$  equals 2,000 and three out of five at 5,000 (marmot). Vesicant effect: Symptoms are very clear. Very strong, practically the same as yperite.

405. Hardly any suffocative effect. Similar to cyanic acid in toxic character.

407. Intolerability limit: 4-5  $mg/m^3$ . Weaker than brom aceto phenone.

408. Strongly irritates the eyes and causes tear shedding.

409. Strongly irritates the eyes.

Toxicity (inhalation): Rabbits and marmots do not die at  $ct$  equals 5,000 in a seven day period. Lacrimatory and irritating actions are weak.

Has sneezing effect.



| Name                                    | Structural formula | Physical state | Boiling point  | Melting point | Physiological effect |
|---|--------------------|----------------|----------------|---------------|----------------------|
| 1. p-tolyl chlor aceto phenon           |                    | Solid          |                | 56            |                      |
| 2. p-methoxy methyl chlor aceto phenon  |                    |                |                |               |                      |
| 3. Acetyl chlor aceto phenon            |                    | Solid          | 117-150 (lit.) | 33            |                      |
| 4. Propyl chlor aceto phenon            |                    | Solid          | 92 (lit.)      | 29.5          |                      |
| 5. Butyl chlor aceto phenon             |                    | Solid          | 167 (lit.)     | 22.5          |                      |
| 6. Amyl chlor aceto phenon              |                    | Liquid         | 133 (lit.)     |               |                      |
| 7. 3,4-dimethyl chlor aceto phenon      |                    | Solid          |                | 73-74         | Lacrimator           |
| 8. 2,4-dimethyl chlor aceto phenon      |                    | Solid          |                | 57            |                      |
| 9. Dimethyl chlor aceto phenon          |                    | Liquid         | 150 (lit.)     | -5            |                      |
| 10. Dipropyl chlor aceto phenon         |                    |                |                |               |                      |
| 11. p-methoxy chlor aceto phenon        |                    | Solid          |                | 99-100        | Lacrimator           |
| 12. p-methoxy brom aceto phenon         |                    | Solid          |                | 34-35         | Lacrimator           |
| 13. 2-chlor-3,4-dioxy aceto phenone     |                    | Solid          |                | 160-169       |                      |
| 14. 2-chlor aceto vanillin              |                    | Solid          |                | 101           |                      |
| 15. 2-chlor-6-oxo-3-methyl aceto phenon |                    | Crystal        |                | 63            | Irritant, Lacrimator |
| 16. Methyl propyl chlor aceto phenon    |                    | Solid          | 157 (lit.)     | 23            | Lacrimator           |
| 17. Chlor acetyl cumol                  |                    | Solid          | 165 (lit.)     | 52            | Lacrimator           |
| 18. 2,4-dichlor acetyl anisitylen       |                    | Solid          |                | 69            | Irritant, Lacrimator |
| 19. 2-chlor aceto naphthalin            |                    | Solid          | 162 (lit.)     | 30            |                      |
| 20. 2-brom aceto naphthalin             |                    | Solid          | 110-114 (lit.) | 81-82         |                      |

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Toxic character

414. Belongs to the first class of lacrimators.
415. Belongs to the second class of lacrimators.
416. Belongs to the first class of lacrimators.
417. Belongs to the second class of lacrimators.
418. Belongs to the first class of lacrimators.
419. Belongs to the second class of lacrimators.
420. Belongs to the first class of lacrimators.
421. Belongs to the second class of lacrimators.
422. Belongs to the first class of lacrimators.
423. Toxicity (inhalation): Marmots do not die at ct equals 1,100, 2,200, 2,200. Rabbits do not die at ct equals 2,000, 5,000, and 10,000. Irritating and lacrimatory actions are fairly strong but weaker than those of chlor aceto phenone.
424. Compared with phosgene, the lethal effect by inhalation is much weaker. Irritating and lacrimatory actions are fairly strong but weaker than those of chlor aceto phenone.
425. Toxicity (inhalation): None out of five dies at ct equals 1,100 and 2,200. One out of five dies at ct equals 4,400 (marmot). Irritating and lacrimatory actions are weak and inferior to chlor aceto phenone.
426. Toxicity (inhalation): Marmots do not die at ct equals 1,100, 2,200, and 4,400. Rabbits do not die at ct equals 10,000. Irritating and lacrimatory actions are weak.
427. Toxicity (inhalation): One out of five marmots dies at ct equals 2,200 and 4,400. Irritating and lacrimatory actions: Twice as much as chlor aceto phenone.
428. Has strong lacrimatory effect.
429. Same as above.
430. Belongs to the third class of lacrimators.
431. Same as above.
432. Unable to detect toxicity.

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# Chemical Abstracts

REGISTRY NUMBER

J. 1951:12

| No.  | Name                                   | Structural formula | Physical state | Boiling point | Melting point | Physiological effect    |
|------|--|--------------------|----------------|---------------|---------------|-------------------------|
| 297. | Chlor acetyl diphenylamin              |                    | Solid          |               | 223           | Irritant, lacrimator    |
| 434. | Brom acetyl diphenylamin               |                    | Solid          |               | 224           |                         |
| 435. | Brom aceto aniline                     |                    | Solid          |               | 212-213       |                         |
| 436. | <i>o</i> -Brom-4-methoxy propio phenon |                    | Crystal        |               | 68.5          |                         |
| 437. | Brom aceto thiophen                    |                    | Solid          | Resolves      | 22-30         | Lacrimator              |
| 438. | Chlor aceto thiophen                   |                    | Solid          | 259           | 45-46         | Lacrimator              |
| 439. | Jod aceto thiophen                     |                    | Liquid         |               | Under normal  | Lacrimator              |
| 440. | Benz schlein saure chlorid             |                    | Liquid         | 170           |               | Lacrimator              |
| 441. | Benzal aceton                          |                    | Solid          | 260-262       | 41-42         |                         |
| 442. | Benzal aceton dibromid                 |                    | Solid          |               | 124-125       |                         |
| 443. | Chlor acetyl toluid                    |                    | Solid          |               | 130           | Lacrimator, sternutator |
| 295. | <i>o</i> -Chlor acetyl toluid          |                    | Solid          |               | 112           | Sternutator             |
| 444. | II-acetylpyridinium chlorid            |                    | Solid          |               |               |                         |
| 445. | Chlor acetoxin                         |                    | Liquid         | 67-68         |               | Irritant                |
| 446. | Brom acetoxin                          |                    | Solid          |               | 36            | Lacrimator, irritant    |
| 447. | Jod acetoxin                           |                    | Solid          |               | 64            |                         |
| 448. | <i>dd</i> -dichlor acetoxin            |                    | Solid          | 34 (5mm)      | 43            | Irritant                |
| 449. | <i>ddd</i> -trichlor acetoxin          |                    | Crystal        |               | 50            | Irritant                |
| 450. | Ethyl ethyl keton oxim                 |                    |                |               |               |                         |
| 451. | <i>o</i> -Chlor acetophenon oxim       |                    |                |               |               |                         |
| 452. | Chloral acetophenon oxim (A)           |                    |                |               |               |                         |

Toxic character

- 101. Possesses irritating odor.
- 102. Unable to detect toxicity.
- 103. Same as above.
- 104.
- 107. Toxicity (inhalation): None out of five marmots dies at ct equals 5,000. None out of two rabbits dies at ct equals 5,000. Lacrimatory effect: Somewhat weaker when compared with known military gases; about the same as chlor compounds.
- 108. Irritating action is apparent but weaker than that of known military gases.
- 109. Hardly any lacrimatory effect. Much weaker than known military gases. Even inferior to chlor and brom groups.
- 110. Toxicity (inhalation): None out of five marmots dies at ct equals 2,000. Two out of two rabbits die at 10,000. Lacrimatory effect is comparatively strong but weaker than that of chlor aceto phenone.
- 111.
- 112.
- 113. Belongs to the third class of lacrimators. Has sternutatory effect.
- 114. Has sternutatory effect.
- 115.
- 116.
- 117.
- 118. Toxicity (inhalation): None out of five marmots dies at ct equals 4,400. None out of four rabbits dies at 15,000. Lacrimatory action is extremely weak.
- 119. Toxicity (inhalation): One out of five marmots dies at ct equals 2 and 4,400. Irritating and lacrimatory actions are weak.
- 120. Toxicity (inhalation): None out of five marmots dies at ct equals 2,200. None out of four rabbits dies at 10,000. Hardly any irritating and lacrimatory actions.
- 121. Toxicity (inhalation): None out of five marmots dies at ct equals 4,400. Weaker than chlor aceto phenone.
- 122. Toxicity (inhalation): None out of five marmots dies at ct equals 2,200. One out of three rabbits dies at 7,000. Irritating, lacrimatory, and anesthetic actions are weak.











## Toxic character

169. Toxicity (inhalation): Two out of four marmots die at ct equals 5,000.

170. Main toxic effect is that exerted on the nerve center.

171. Main damaging action: Markedly inferior to yperite.

172.

173. Toxicity (inhalation): One out of five dies at ct equals 5,000 and three out of five at 10,000 (marmot). Although it irritates the mucous membranes, causes tear shedding, and damages the lungs, it is weaker than known toxic agents.

174.

175. Toxicity (inhalation): None out of five marmots dies at ct equals 5,000 and 15,000. Compared with known military gases, toxicity is ~~inferior~~.

176. Physiological effect is similar to that of phosphin.

177. Lethal dose (skin application): Over 100 mg/kg (rabbit). Lethal dose (inhalation): Marmots do not die at ct equals 5,000.

178.

179.

180.

181. Vesicant effect on skin: ~~inferior~~ Markedly inferior in comparison with ~~yperite~~.

182.

183.

184. Lethal dose (hypodermic injection): Over 50 mg/kg. Lethal dose (inhalation): ct equals over 2,500 (marmot).

185.

186.

187. Lethal dose (skin application): Over 50 mg/kg. Lethal dose (inhalation): ct equals over 10,000 (marmot).

188.

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198.



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OS 15 U.S. DISSEMINATION

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|   | Structural | Physical state    | Boiling point | Melting point |                 |
|---|------------|-------------------|---------------|---------------|-----------------|
| 488. 1,1-dimethyl phenyl dichlor phosphin |            | Liquid            | 256-257       |               |                 |
| 489. 1,1-dimethyl phenyl dichlor phosphin |            | Liquid            | 253-254       |               | Vesicant        |
| 490. Phenyl for dichlorid                 |            | Liquid            | 175           |               |                 |
| 491. Quicksilber diethyl                  |            | Liquid            | 159           |               | Vesicant        |
| 492. Quicksilber diallyl                  |            |                   |               |               |                 |
| 493. Quicksilber dipropyl                 |            | Liquid            | 189-191       |               | Vesicant        |
| 494. Aethyl quicksilber chlorid           |            |                   |               |               |                 |
| 495. Propyl quicksilber chlorid           |            | Solid             |               | 113           | Vesicant        |
| 496. Butyl quicksilber chlorid            |            | Solid             |               | 127.5         |                 |
| 497. Eisen penta carbonyl                 |            | Liquid            | 102.7         | -20           |                 |
| 498. Nickel penta carbonyl                |            | Liquid            | 143.2         | -25           |                 |
| 499. Tetramethyl blei                     |            | Liquid            | 110           | -27.5         | Systemic poison |
| 500. Trimethyl blei bromid                |            | Capillary crystal |               | 193           |                 |
| 501. Trimethyl blei bromid                |            | Capillary crystal |               | 193           |                 |
| 502. Trimethyl blei jodid                 |            |                   |               |               |                 |
| 503. Dimethyl blei dichlorid              |            | Crystal           |               |               |                 |
| 504. Dimethyl blei dibromid               |            | Powder crystal    |               |               |                 |
| 505. Dimethyl blei dijodid                |            | Leaf crystal      |               |               |                 |
| 506. Tetramethyl zinn                     |            | Liquid            | 78            |               | Systemic poison |
| 508. Trimethyl zinn bromid                |            |                   | 143           | 87            |                 |
| 509. Trimethyl zinn jodid                 |            | Liquid            | 170           | 14            |                 |

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DISSEMINATION FORM FOR ID TRANSLATIONS

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184. Toxic character

488. Lethal dose (skin application): over 50 mg/kg. Lethal dose (inhalation): at equals over 10,000 (marmot).

489. Lethal dose (skin application): over 50 mg/kg. Lethal dose (inhalation): at equals over 10,000 (marmot).

490.

491. Lethal dose (hypodermic injection): None out of four dies at 10 mg/kg. Four out of four die at 20 mg/kg.

492.

493. Lethal dose (hypodermic injection): One out of four dies at 10 mg/kg. Four out of four die at 20 mg/kg.

494.

495. Vesicant effect on skin: plus lethal dose (skin application): 50 mg/kg. (rabbit).

496. Vesicant effect on skin: plus, lethal dose (skin application): 50 mg/kg.

497. Lethal dose (inhalation): None out of five dies at at equals 5,000, one out of ten at 10,000, and none out of five at 20,000 (marmot).

498. Lethal dose (inhalation): None out of five dies at at equals 10,000, one out of five at 20,000 (marmot). One out of three dies at 20,000 (rabbit.)

499. Toxicity (inhalation): Lethal density: at equals over 10,000 (5 minutes) for rabbits and marmots.

500.

501.

502.

503.

504.

505.

506. Toxicity (inhalation): None out of five marmots and none out of three rabbits die at at equals 5,000. Lethal dose (hypodermic injection): 60% die at 10 mg/kg.

507. Toxicity (inhalation): Marmots and rabbits do not die at at equals 5,000. Very weak when compared with known military gases.

508. Toxicity (inhalation): None out of three rabbits and two out of ten marmots die at at equals 5,000. Lethal dose (hypodermic injection): four out of five die at 3 mg/kg. and five out of five die at 5-10 mg/kg. (rabbit). Hypodermic injection effect is like that of lewisite, but inhalation effect is much weaker.

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| No.  | Name                        | Structural formula | Physical state       | Boiling point    | Melting point           | Physiological effect |
|------|-----------------------------|--------------------|----------------------|------------------|-------------------------|----------------------|
| 510. | Dimethyl zinn<br>fluorid    |                    | liquid               |                  | 375                     |                      |
| 511. | Dimethyl zinn<br>dichlorid  |                    | solid                | 185-190          | 103                     |                      |
| 512. | Dimethyl zinn<br>dibromid   |                    | Crystal              | 208-210          | 70                      |                      |
| 513. | Dimethyl zinn<br>diiodid    |                    | Crystal              | 283              | 63                      |                      |
| 514. | Dimethyl zinn<br>difluorid  |                    | leaf<br>crystal      |                  | 360<br>(recrystallized) |                      |
| 515. | Dimethyl zinn<br>tribromid  |                    | Crystal              |                  | 53                      |                      |
| 516. | Dimethyl zinn<br>trichlorid |                    | Crystal              |                  | 43                      |                      |
| 517. | Dimethyl zinn<br>triiodid   |                    | Capillary<br>crystal |                  | 86.5                    |                      |
| 518. | Tetra ethyl blei            |                    | liquid               | 13/13mm          |                         | Systemic<br>poison   |
| 519. | Triethyl blei<br>chlorid    |                    | Capillary<br>crystal |                  | 171                     |                      |
| 520. | Triethyl blei<br>bromid     |                    | Capillary<br>crystal |                  | 103-104                 |                      |
| 521. | Triethyl blei<br>dichlorid  |                    | Capillary<br>crystal |                  | 207-220                 |                      |
| 522. | Diethyl blei<br>diiodid     |                    | Capillary<br>crystal |                  |                         |                      |
| 523. | Tetra ethyl zinn            |                    | oil<br>liquid        | 175              | -112                    | Incorinator          |
| 524. | Triethyl zinn<br>chlorid    |                    | liquid               | 200              | 15.5                    |                      |
| 525. | Triethyl zinn<br>jodid      |                    | liquid               | 117.5<br>(1.5mm) | -34.5                   |                      |
| 526. | Triethyl zinn<br>fluorid    |                    | Capillary<br>crystal |                  | 302<br>(closed tube)    |                      |
| 527. | Diethyl zinn<br>dichlorid   |                    |                      | 220              | 35                      |                      |
| 528. | Diethyl zinn<br>diiodid     |                    |                      | 232-235          | 63                      |                      |

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Latin Summary

510.

511. Toxicity (inhalation): None out of three hamsters dies at or equals 10,000, 15,000.

512. Toxicity (inhalation): Rabbits and hamsters do not die at or equals 5,000.

513. Toxicity (inhalation): Rabbits and hamsters do not die at or equals 5,000.

514.

515.

516.

517.

518. Toxicity (inhalation): Rabbits and hamsters do not die at or equals 5,000. Ten out of three rabbits and none out of five hamsters die at or equals 10,000. Lethal dose (hypodermic injection): In rabbits at 15 mg/kg and one out of five dies at 30 mg/kg (rabbit).

519. Toxicity (inhalation): None out of five rabbits and ten out of ten hamsters die at or equals 5,000.

520.

521.

522.

523. Toxicity (inhalation): Rabbits and hamsters do not die at or equals 5,000 to 5,000.

524.

525. Toxicity (inhalation): Rabbits and hamsters do not die at or equals 5,000 to 10,000. Lethal dose (hypodermic injection): One out of five dies at 3 mg/kg; and 5 mg/kg. Four out of five die at 10 mg/kg (rabbit).

526.

527.

528.

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|      |                               | Structural | Physical             | Boiling                        | Melting | Physicochem |
|------|-------------------------------|------------|----------------------|--------------------------------|---------|-------------|
| 529. | Diethyl zinn<br>dijodid       |            | Capillary<br>crystal | 245                            | 42      |             |
| 530. | Diethyl zinn<br>diklorid      |            | Capillary<br>crystal |                                | 229     |             |
| 531. | Triphenyl blei<br>chlorid     |            | Capillary<br>crystal |                                | 206     |             |
| 532. | Triphenyl blei<br>bromid      |            | Capillary<br>crystal |                                | 166     |             |
| 533. | Triphenyl blei<br>jodid       |            | Crystal              |                                | 142     |             |
| 534. | Diphenyl blei<br>diklorid     |            | Powder               |                                |         |             |
| 535. | Diethyl zinn                  |            | Liquid               | 118                            | -23     |             |
| 536. | Diphenyl blei<br>diklorid     |            | Powder               |                                |         |             |
| 537. | Diphenyl blei<br>diklorid     |            | Leaf<br>crystal      | 101-103                        |         |             |
| 538. | Tetraphenyl zinn              |            | Solid                |                                | 225     |             |
| 539. | Triphenyl zinn<br>chlorid     |            | Crystal              | 240<br>(23.5mm)                | 206     |             |
| 540. | Triphenyl zinn<br>bromid      |            | Solid                | 249<br>(23.5mm)                | 191     |             |
| 541. | Triphenyl zinn<br>jodid       |            | Crystal              | 253<br>(23.5mm)                | 181     |             |
| 542. | Diphenyl zinn<br>diklorid     |            | Crystal              | 333-337                        | 42      |             |
| 543. | Diphenyl zinn<br>diklorid     |            | Crystal              | 230<br>(12mm)                  | 30      |             |
| 544. | Phenyl zinn<br>trichlorid     |            | Liquid               | 245<br>(25mm)<br>112<br>(25mm) |         |             |
| 545. | Phenyl zinn<br>tribromid      |            | Liquid               | 182-183<br>(20mm)              |         |             |
| 546. | Phenyl zinn<br>trijodid       |            |                      |                                |         |             |
| 547. | Triphenyl antimon<br>diklorid |            | Capillary<br>crystal |                                | 143     |             |

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5 ID DIA TRANSLATION

REGISTRY NUMBER

DATE RECEIVED

| No.  | Toxic character  |
|------|--|
| 529. | Toxicity (inhalation): Rabbits and marmots do not die at a dose equal to 5,000.  |
| 530. |  |
| 531. |  |
| 532. |  |
| 533. |  |
| 534. |  |
| 535. |  |
| 536. |  |
| 537. |  |
| 538. | Toxicity (inhalation): Marmots do not die at a dose equal to 15,000.   |
| 539. |  |
| 540. | Lethal dose (inhalation): One out of three marmots dies at a dose equal to 5,000 and 10,000 (two days later).  |
| 541. | Lethal dose (inhalation): One out of three marmots dies at a dose equal to 5,000 (one day later) and two out of three at 10,000 (one to two days later). |
| 542. |  |
| 543. |  |
| 544. |  |
| 545. |  |
| 546. |  |
| 547. |  |

# RESTRICTED



RESTRICTED

(Classification Stamp)

[illegible]

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50. Acute toxicity

51. Has toxic character resembling that of arsenic compounds. Weak.

52. When heated it strongly irritates the mucous membranes. Irritating action resembles that of phenyl dichloro arsin. Lethal dose (skin application): None out of five rabbits die at 10 mg/kg.

53.

54.

55. Lethal dose: it equals 3,400 (white mouse) 750 mg/m<sup>3</sup>—30 minutes—human being.

56. Strongly irritates the mucous membranes.

57.

58.

59. Resolves easily. Difficult to determine lethal dose.

60.

61. Hypodermic injection lethal dose: over 30 mg/kg. (rabbit.) No vesicant action.

62.

63.

64. Skin effect on skin: plus. Intolerability limit: >100 mg/m<sup>3</sup>.

65.

66. No vesicant effect on skin.

67. Difficult to find vesicant effect on skin.

68.





*Journal of Management Studies*, 19(1), 67-80.

DISSEMINATION FORM FOR ID TRANSLATIONS



# RESTRICTED

|      |  |                               |                         |                         |          |
|------|--|-------------------------------|-------------------------|-------------------------|----------|
| 584. | $\beta$ -chlor allyl butyl sulfid            | Liquid                        | 73-8<br>(12mm)          | -52                     | Vesicant |
| 585. | $\beta$ -chlor allyl amyl sulfid             | Liquid                        | 79.5<br>(7mm)           | > -97                   | Toxic    |
| 586. | Diallyl sulfid                               | Liquid                        | 110                     | About -70               |          |
| 587. | Dipropyl sulfid                              | Liquid                        | 111.5-<br>112           |                         |          |
| 588. | Diiso propyl sulfid                          | Liquid                        |                         |                         |          |
| 589. | $\gamma\gamma'$ -dichlor diallyl sulfid      | Liquid                        | 106<br>(7mm)            |                         |          |
| 590. | $\delta$ -chlor dipropyl sulfid              |                               |                         |                         |          |
| 591. | $\gamma\gamma'$ -dichlor dipropyl sulfid     | Liquid                        | 155-156<br>(17mm)       | -43                     | Vesicant |
| 592. | $\beta\beta'$ -dichlor dipropyl sulfid       | Liquid                        | 112-3<br>(3mm)          | -37                     | Vesicant |
| 593. | $\gamma\gamma'$ -dichlor diiso propyl sulfid | Liquid                        | 111-2<br>(15mm)         | -40                     |          |
| 594. | Di-n-butyl sulfid                            | Liquid                        | 131-133                 | > -77                   | Vesicant |
| 595. | Iso dibutyl sulfid                           |                               |                         |                         |          |
| 596. | $\beta\beta'$ -dichlor diiso butyl sulfid    | Liquid                        | 102.5-<br>103<br>(11mm) |                         | Vesicant |
| 597. | Diiso amyl sulfid                            | Liquid                        | 36<br>(22mm)            | > -75                   | Vesicant |
| 598. | Dihexyl sulfid                               |                               |                         |                         |          |
| 600. | Yperit C                                     | Composition                   | Liquid                  | -50                     | Vesicant |
| 601. | Yperit B                                     | Same as above (Yperit system) | Liquid                  | 99-110<br>(11mm)<br>-50 | Vesicant |
| 602. | Yperit A                                     | Same as above (Yperit gas)    | Liquid                  | 95-100<br>(13mm)<br>-50 | Vesicant |

## RESTRICTED

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SECRET NUMBER

Toxic character.

Vesicant effect on skin: # . Lethal dose (hypodermic injection):  
>30mg/kg.

Vesicant effect on skin: # . Lethal dose (hypodermic injection):  
>30 mg/kg.

Skin damaging action: No action detected.

Vesicant effect on skin can hardly be detected.

Vesicant effect on skin: # .

Same as above.

Vesicant effect on skin: # .

Vesicant effect on skin: + .

No vesicant action.

Vesicant effect on skin: + .

Lethal dose (inhalation): 10 percent die at 20 mg/kg, 60 percent die. Lethal dose (skin application):  
20 mg/kg, 10 percent of rabbits die; at 50 mg/kg, 30 percent die.

Lethal dose (inhalation): ct equals over 5,000 (marmot). ct equals  
10,000 (rabbit). easier than compared with yperite 0.4.3. etc.

Lethal dose (inhalation): 10 percent die at ct equals 5,000 and 40  
percent at 10,000 (marmot). Lethal dose (skin application): 10 percent  
die at 10 mg/kg, 10 percent at 20 mg/kg, and 30 percent at 50 mg/kg  
(rabbit).

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| No.  | Name             | Structural formula   | Physical state | Boiling point     | Melting point | Physiological effect |
|------|------------------|--|----------------|-------------------|---------------|----------------------|
| 605. | Xperit P         | Same as above<br>(INDURA oil)  | Liquid         |                   | -50           | Vesicant             |
| 606. | Xperit C'        | Toxicity changes depending on mixture of chlorhydrin and chlorhydrin C | Liquid         | 108-120<br>(15mm) | -43           | Vesicant             |
| 607. | Xperit C' No. 1  | ) mixed  | Liquid         |                   | -20           | Vesicant             |
| 608. | Xperit C' No. 2) | yperit   | Liquid         |                   | -9            | Vesicant             |
| 609. | Xperit C' 3)     | system   | Liquid         |                   | -7            | Vesicant             |
| 610. | Xperit C' 4)     |  | Liquid         |                   | -3            | Vesicant             |
| 611. | Xperit C' 5      | Xperit D   | Liquid         |                   | 10.3          | Vesicant             |
| 612. | Xperit C' 6      | Xperit E   | Liquid         |                   | -11           | Vesicant             |
| 613. | Xperit C' 7)     | mixed chlorhydrin  | Liquid         |                   | -50           | Vesicant             |
| 614. | Xperit C' 8)     | system   | Liquid         |                   | -38           | Vesicant             |
| 615. | Xperit C' 9      |  | Liquid         |                   | -25           | Vesicant             |
| 616. | Xperit C' 10     |  | Liquid         |                   | -21           | Vesicant             |
| 617. | Xperit C' 11)    | lewisite   | Liquid         |                   |               | Vesicant             |
| 618. | Xperit C' 12)    | mixture  | Liquid         |                   |               | Vesicant             |
| 619. | Xperit C' 13     | No. 15 100g, lewisite 20g)   | mixed Liquid   |                   |               | Vesicant             |
| 620. | Xperit C' 14     |  | Liquid         |                   | Under -50     | Vesicant             |
| 621. | Xperit C' 15     |  | Liquid         |                   | -46.5         | Vesicant             |
| 622. | Xperit C' 16     |  | Liquid         |                   | -37           | Vesicant             |
| 623. | Xperit C' 17     |  | Liquid         |                   | -43.5         | Vesicant             |

RESTRICTED

Toxic character

Lethal dose (skin application): Rabbits die at 20 mg/kg. Lethal dose (inhalation):  $\frac{1}{2}$  of marmots die at or equals 200-6,000.

Lethal dose (hypodermic injection): 90 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 40 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 85 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 30 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 90 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 40 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 90 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 20 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 90 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 30 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 55 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 10 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 30 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 10 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 30 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 20 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 30 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 20 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 90 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 30 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 90 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 30 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 90 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 70 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 30 percent of rabbits die at 15 mg/kg. Lethal dose (skin application): 70 percent of rabbits die at 20 mg/kg.

Lethal dose (hypodermic injection): 10 percent of marmots die at 10 mg/kg. Lethal dose (skin application): 30 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 20 percent of rabbits die at 15 mg/kg. Lethal dose (skin application): 20 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 20 percent of rabbits die at 15 mg/kg. Lethal dose (skin application): 30 percent die at 20 mg/kg.

Lethal dose (hypodermic injection): 10 percent of marmots die at 15 mg/kg. Lethal dose (skin application): 40 percent of rabbits die at 20 mg/kg.



| No.  | Chem.  | Gr. | No.    | Structural<br>Formula | Physical<br>state | Boiling<br>point | Melting<br>point | Hydrolytic<br>action |
|------|--------|-----|--------|-----------------------|-------------------|------------------|------------------|----------------------|
| 631. | Yperit | Gr. | No. 13 | No. 1 C               | Liquid            | 90-120<br>(10mm) | -32              | Vesicant             |
| 632. | Yperit | Gr. | 19     |                       | Liquid            | 92-113<br>(6mm)  | Under<br>-43     | Vesicant             |
| 633. | Yperit | Gr. | 20     |                       | Liquid            | 92-113<br>(6mm)  | -45              | Vesicant             |
| 634. | Yperit | Gr. | 21     |                       | Liquid            | 92-115<br>(6mm)  | -45              | Vesicant             |
| 635. | Yperit | Gr. | 22     |                       | Liquid            | 94-113<br>(3mm)  | -43              | Vesicant             |
| 636. | Yperit | Gr. | 23     |                       | Liquid            |                  | -50              | Vesicant             |
| 637. | Yperit | Gr. | 24     |                       | Liquid            |                  | -50              | Vesicant             |
| 638. | Yperit | Gr. | 25     |                       | Liquid            |                  |                  | Vesicant             |
| 639. | Yperit | Gr. | 26     |                       | Liquid            |                  | -31              | Vesicant             |
| 640. | Yperit | Gr. | 27     |                       | Liquid            |                  |                  | Vesicant             |
| 641. | Yperit | Gr. | 28     |                       | Liquid            |                  | -38              | Vesicant             |
| 642. | Yperit | Gr. | 29     | Improved<br>No. 1 C   | Liquid            |                  | -33              | Vesicant             |
| 643. | Yperit | Gr. | 30     |                       | Liquid            |                  | -35              | Vesicant             |
| 644. | Yperit | Gr. | 31     |                       | Liquid            |                  | -22              | Vesicant             |
| 645. | Yperit | Gr. | 32     |                       | Liquid            |                  | -50              | Vesicant             |
| 646. | Yperit | Gr. | 33     | No. 1A<br>No. 106     | Liquid            |                  | -16              | Vesicant             |
| 647. | Yperit | Gr. | 34     | Improved<br>No. 1A    | Liquid            |                  | -13              | Vesicant             |
| 648. | Yperit | Gr. | 35     |                       | Liquid            |                  | -0.5             | Vesicant             |
| 649. | Yperit | Gr. | 36     |                       | Liquid            |                  | -6               | Vesicant             |

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Classification Stamp

DISSEMINATION FORM FOR ID TRANSLATIONS

SECURITY NUMBER

CONTROL NUMBER

- No. 621. Lethal dose: 40% of rabbits die at 20 mg/kg. Skin application: 70% of rabbits die at 50 mg/kg.
625. Lethal dose (skin application): 30% die at 10 mg/kg. 70% die at 15 mg/kg.
626. Lethal dose (skin application): 50% die at 10 mg/kg.
627. Lethal dose (skin application): 60% die at 10 mg/kg.
628. Lethal dose (skin application): 30% die at 10 mg/kg. 70% die at 15 mg/kg.
629. Lethal dose (skin application): 60% of rabbits die at 20 mg/kg. Effect of skin application is slightly inferior.
630. Lethal dose (skin application): 40% of rabbits die at 20 mg/kg. effect of skin application is somewhat inferior.
631. Lethal dose (skin application): 10% of rabbits die at 20 mg/kg. Inferior when compared to yperit.
632. Lethal dose (skin application): 50% of rabbits die at 20 mg/kg.
633. Lethal dose (skin application) 20% of rabbits die at 20 mg/kg.
634. Lethal dose (skin application): 30% of rabbits die at 20 mg/kg.
635. Lethal dose (inhalation): 20% of marmots die at ct equals 5,000. Lethal dose (skin application): 20% of rabbits die at 20 mg/kg.
636. Lethal dose (inhalation): 10% of marmots die at ct equals 5,000. Lethal dose (skin application): No rabbits die at 20 mg/kg.
637. Lethal dose (inhalation): 10% of marmots die at ct equals 5,000. Lethal dose (skin application): 10% of rabbits die at 20 mg/kg.
638. Lethal dose (inhalation): 10% of marmots die at ct equals 5,000. Lethal dose (skin application): No rabbits die at 20 mg/kg.
639. Lethal dose (inhalation): 30% of marmots die at ct equals 5,000. Lethal dose (skin application): 60% of rabbits die at 20 mg/kg.
640. Lethal dose (inhalation): 20% of marmots die at ct equals 5,000. Lethal dose (skin application): 40% of rabbits die at 20 mg/kg.
641. Lethal dose (inhalation): 20% of marmots die at ct equals 5,000. Lethal dose (skin application): No rabbits die at 20 mg/kg.
642. Lethal dose (inhalation): 30% of marmots die at ct equals 5,000. Lethal dose (skin application): 40% of marmots die at 20 mg/kg.
643. Lethal dose (inhalation): 20% of marmots die at ct equals 5,000. Lethal dose (skin application): 20% of marmots die at 20 mg/kg.
644. Lethal dose (inhalation): 10% of marmots die at ct equals 5,000. Lethal dose (skin application): 20% of marmots die at 20 mg/kg.

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|      | Chemical name                              | Physical state | Boiling point               | Melting point     | Effect                    |
|------|--|----------------|-----------------------------|-------------------|---------------------------|
|      | Excerpt C <sup>1</sup> No. 37              | Liquid         |                             | 5.5               |                           |
|      | Excerpt C <sup>1</sup> 38                  | Liquid         |                             |                   |                           |
|      | Thio diglycol<br>sulfate chlorid           | Liquid         | 110-113<br>(12mm)           |                   | Vesicant                  |
|      | Thio diglycol<br>diacetat                  | Liquid         | 155-156<br>(80mm)           | -20<br>No doubt   |                           |
|      | $\beta$ -chlor athyl<br>phenyl sulfid      | Liquid         | 137-8<br>(36mm)             |                   | Vesicant                  |
|      | $\beta$ -chlor athyl<br>cyklo hexyl sulfid | Liquid         | 195-8<br>(5mm)              |                   |                           |
|      | Dio (2-chlor<br>phenyl) sulfid             | Solid          |                             | 185<br>(resolves) |                           |
|      | Dio (1-chlor<br>phenyl) sulfid             | Solid          |                             | 88-89             |                           |
|      | Dio ( $\beta$ -chlor<br>ethyl) trisulfid   | Liquid         | 140<br>(20mm)               | > -25             | Vesicant                  |
|      | Dio ( $\beta$ -chlor<br>ethyl) trisulfid   | Liquid         | 135<br>(8-10mm)<br>resolves | > -35             | Vesicant                  |
|      | Dibenzyl sulfid                            | Solid          | 170-175<br>(13mm)           | 49                |                           |
|      | Dibenzyl disulfid                          | Solid          |                             | 71-72             |                           |
|      | Dio (athylthio<br>athyl) sulfid            | Liquid         | 173-175                     | 17                |                           |
| 658. | Dio-(phenyl thio<br>athyl) sulfid          | Solid          |                             | 57.5              |                           |
| 659. | Dio-(Aryl thio<br>ethyl) sulfid            |                | 170<br>(1mm)                | 20                |                           |
| 660. | Bis-(phenoxy athyl)<br>sulfid              | Solid          |                             | 54.2              |                           |
| 661. | Bis + (tribromphen-<br>oxyl athyl) sulfid  | Solid          |                             | 118.5             |                           |
| 662. | Thio phosgen (Thio<br>carbonyl dichlorid)  | Liquid         | 77.5                        |                   | Lacrimator<br>lung injur. |
|      | Trithio Kohlensaure<br>dimethyl ester      | Solid          | 225                         |                   |                           |

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## Toxic character

Lethal dose (inhalation): 50% of marmots die at ct equals 5,000.  
 Lethal dose (skin application): 50% of marmots die at 30 mg/kg.

Lethal dose (inhalation): 50% of marmots die at ct equals 2,000.  
 Lethal dose (skin application): 50% of marmots die at 20 mg/kg.

Lethal dose (inhalation): Rabbits do not die at ct equals 5,000 to 10,000. Although this agent possesses slight lacrimatory action and irritating action on the nose and mucous membranes, its lung injurious action is weak. Vesicant action: Markedly inferior in comparison with No. 1.

Action is weak (markedly inferior to yperite).

Vesicant effect on skin: +

Vesicant effect on skin: ++

No vesicant effect.

Vesicant effect on skin: +

Vesicant effect on skin: ++

Vesicant effect on skin: ++

20% olive oil solution has no effect whatsoever on the human body.

Lethal dose for white mice is 600 mg/kg.

Lethal dose for white mice is 550 mg/kg.

Lethal dose (inhalation): 50% of marmots die at ct equals 2,500.

Vesicant effect on skin: ++

Bad odor.



| IDENTIFICATION |  | REGISTRY NUMBER    |                | CAS NUMBER                  |                         |                            |
|----------------|--|--------------------|----------------|-----------------------------|-------------------------|----------------------------|
| No.            | Name                                   | Structural formula | Physical state | Boiling point               | Melting point           | Physiological effect       |
| 664.           | Trithio kohlenstaure diethyl ester     |                    | Oil            | 240                         |                         |                            |
| 665.           | Dithio kohlenstaure ethyl ester        |                    | Oil            | 24                          | -53                     |                            |
| 666.           | Dithio essigsäure                      |                    | Liquid         | 43-5<br>(22-23mm)           |                         |                            |
| 668.           | Trithio acetone                        |                    | Solid          | 130<br>(13mm)               | 24                      |                            |
| 154.           | Perchlor methyl mercaptan              |                    | Liquid         | 149                         |                         | Lacrimator                 |
| 155.           | Perbrom methyl mercaptan               |                    | Crystal        |                             | 108                     | Lung injur-ant, Irrita-tor |
| 669.           | Diethyl dithio methan                  |                    | Liquid         | 184                         |                         |                            |
| 670.           | Diethyl dithio ethan                   |                    | Oil            | 170<br>(13mm)               |                         |                            |
| 671.           | Diethyl dichlor diethyl disulfid       |                    | Solid          |                             | 49-51                   | Vesicant                   |
| 672.           | Isopropyliden dichlor diethyl disulfid |                    | Liquid         | 52-60<br>(23mm)<br>resolves |                         |                            |
| 673.           | 2-ethyl-1-thioethan                    |                    | Liquid         | 220-225                     | 44                      | Poison                     |
| 437.           | Brom aceto thiophen                    |                    | Solid          | Resolves                    | 29-30                   | Irritant                   |
| 438.           | Chlor aceto thiophen                   |                    | Solid          | 259                         | 45-46                   | Irritant                   |
| 439.           | Jod aceto thiophen                     |                    | Liquid         |                             | Under normal conditions | Irritant                   |
| 674.           | $\beta$ -chloro vinyl arsin sulfid     |                    | Liquid         |                             |                         | Vesicant                   |
| 675.           | Dipropyl selenid                       |                    | Liquid         | 156-157                     |                         | Vesicant                   |
| 676.           | $\beta\beta$ -dichlor diethyl selenid  |                    | Solid          |                             | 21.3                    |                            |
| 677.           | $\beta\beta$ -dichlor diethyl selenid  |                    | Solid          |                             | 121-122                 | Vesicant                   |
| 678.           | $\beta\beta$ -dichlor diethyl selenid  |                    | Solid          |                             | 100.5                   |                            |

No. Toxic character

664. Unpleasant odor.

665. Lethal dose 0.5 grams per kg.

666. Unpleasant odor similar to that of mercaptan and allyl sulfide.

668.

154. Lethal dose (inhalation): Four out of five marmots die (five days later) at ct equals 5,000. About the same as known gases, and irritating and long injurious effects and reaction time those of known military gases.

155. Lethal dose (inhalation): Two out of five marmots die (14 days later) at ct equals 2,000. Two out of five marmots die (14 days later) at ct equals 5,000.

669. Bad odor.

670.

671. Lethal dose (inhalation): 50% of marmots die (7 days later) at ct equals 2,000. Lethal dose (skin application): <100 mg/kg. (rabbit). Lethal dose (hypodermic injection): 30 mg/kg. (marmot).

672.

673. Has effect similar to that of nitro benzol.

157. Toxicity (inhalation): None out of five marmots and none out of two rabbits die at ct equals 5,000. Lachrimatory action: Somewhat inferior to known military gases; about the same as chlor compounds.

3. Toxicity action is equivalent, but is somewhat inferior to known military gases.

159. Toxicity (inhalation): None out of five dies at ct equals 2,000. (rabbit, marmot). Hardly any lachrimatory action present. It is markedly inferior in this respect to known military gases and is even inferior to chlor and brom compounds.

674. Vesicant effect on skin: ++. Covering of skin actually worse in comparison with No. 2.

675. Toxicity (inhalation): One out of ten marmots and none out of three rabbits die at ct equals 5,000. Lethal dose (skin application): One out of five rabbits dies at 30 mg/kg. to 50 mg/kg.

676.

677. Lethal dose (inhalation): None out of two marmots dies at ct equals 2,000. Three out of five rabbits or marmots die at 5,000. Vesicant effect: Markedly inferior to No. 1.

678. Lethal dose (inhalation): 50% of rabbits die (within 7 days) at 20 mg/kg. Lethal dose (skin application): 50% of rabbits die (within 7 days) at 20 mg/kg.



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DISSEMINATION FORM

REGISTRY NUMBER

CLASSIFICATION

|      | Name                                       | Physical State | Melting Point          | Boiling Point | Remarks                 |
|------|--|----------------|------------------------|---------------|-------------------------|
| 672. | Bis (n-butyl thioethyl) sulfoxyl           | Solid          |                        | 25            |                         |
| 673. | Diethyl sulfoxyl                           | Liquid         | 70.2                   | -10.5         |                         |
| 674. | Diethyl thio sulfoxyl                      | Liquid         | 70-80<br>(20mm)        |               |                         |
| 676. | Thiophenyl bromid                          | Liquid         | 32.5                   |               | Toxic - strong irritant |
| 680. | Sulfonyl chlorid                           | Liquid         | 69.1                   | -54.1         | Lung Injurious          |
| 681. | Dimethyl sulfat                            | Liquid         | 133                    | -26.8         | Irritant, vesicant      |
| 682. | Bis (chlor methyl) sulfat                  | Liquid         | 102.5-104.5<br>(20mm)  |               |                         |
| 683. | Dimethyl sulfat                            | Liquid         | 96<br>(10mm)           | -21.5         |                         |
| 684. | Methyl schwefelsaure chlorid               | Liquid         | 132                    | -70           |                         |
| 685. | Chlor methyl schwefelsaure chlorid         | Liquid         | 50.5-59.5<br>(23.5mm)  |               | Lacrimator              |
| 686. | Ethyl schwefelsaure chlorid                | Liquid         | 152-153                |               | Irritant                |
| 687. | $\beta$ -chlor ethyl schwefelsaure chlorid | Liquid         | 109<br>(22mm)          |               | Irritant                |
| 688. | Propyl schwefelsaure chlorid               | Liquid         | 71.5-75.5<br>(22-33mm) |               |                         |
| 689. | Chlor sulfonsaure                          | Liquid         | 156                    |               | Smoke                   |
| 690. | Ethyl sulfonsaure chlorid                  | Liquid         | 113-114<br>(26mm)      |               | Irritant                |
| 691. | Methyl sulfonsaure chlorid                 | Liquid         | 125-127                |               | Vesicant                |
| 692. | Trichlor methyl sulfonsaure chlorid        | Solid          | 170 -                  | 135           | Irritant                |
| 693. | Acetyl sulfonsaure chlorid                 | Liquid         | 122                    |               | Irritant                |

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No. Toxic character

619.

Toxicity (inhalation): None out of ten marmots dies at ct equals 2,000; one out of ten at 5,000; and two out of ten at 10,000. Slight irritation. Toxic effect stronger than SO<sub>2</sub>.

625.

Toxicity (inhalation): None out of five marmots dies at ct equals 1,000 and one out of five dies at 2,200. Irritating and lacrimatory actions are very weak. Relieved to be less than one-fifth as effective as aceto phenone.

630.

Slight irritating action. Toxicity (inhalation): None out of ten marmots dies at ct equals 2,000; one out of ten at 5,000; and two out of ten at 10,000.

641.

Lethal dose (skin application): Rabbits do not die at >20 mg/kg. Toxicity (inhalation): some irritating action at ct equals 5,000 (rabbit, marmot).

642.

No irritating action.

643.

Like dimethyl sulfat, it is not a violent toxic agent.

644.

Weak irritant. Toxicity (inhalation): There is some irritation and lacrimation at ct equals 5,000.

645.

Irritating action is strong. Lacrimatory action (experiments).

646.

Irritating action is fairly strong. Lethal dose (hypodermic injection): One out of five dies at 10 mg/kg. Toxicity (inhalation): Irritating action is fairly strong at ct equals 5,000.

647.

Lethal dose (hypodermic injection): None out of five marmots dies at 10 mg/kg. Toxicity (inhalation): There is some irritating action at ct equals 5,000 (rabbit, marmot).

658.

Irritating action is weak. Animal tests cannot be conducted, owing to its easily resolving character.

659.

Causes rotting of skin.

660.

Vesicant effect: markedly weaker in comparison with No. 1.

661.

Toxicity (inhalation): None out of five dies at 5,000 to 10,000 (rabbit, marmot). Vesicant effect: Weak, inferior to No. 1.

662.

Weak irritant. Lethal dose (hypodermic injection): One out of five marmots dies at 10 mg/kg. Toxicity (inhalation): None do not die at ct equals 5,000.

663.

Toxicity (inhalation): Rabbits and marmots do not die at ct equals 2,000. Lethal dose (hypodermic injection): One out of five rabbits dies at 30 mg/kg., and two out of five at 50 mg/kg.



| Item | Name   | Structural formula | Physical state | Boiling point       | Melting point | Effects         |
|------|--|--------------------|----------------|---------------------|---------------|-----------------|
| 694. | Athyl sulfon-sauco chlorid                             |                    | Liquid         | 132-135             |               | Irritant        |
| 695. | $\beta$ -chlor athyl sulfonsauco chlorid               |                    | Liquid         | 110 (1mm)           |               | Irritant        |
| 696. | Dimethyl amin-II sulfonsauco chlorid                   |                    | Liquid         | 122.5-123 (70mm)    |               | Irritant        |
| 697. | Diethyl amin-II sulfonsauco chlorid                    |                    | Liquid         | 111-115 (15mm)      |               | Irritant        |
| 698. | Dichlor dimethyl sulfon                                |                    |                |                     |               |                 |
| 699. | Diethyl sulfon   |                    | Solid          | 243                 | 70            |                 |
| 700. | $\beta\beta$ -dichlor diethyl sulfon                   |                    | Solid          | 230 some resolution | 56            | Vesicant        |
| 701. | $\beta\beta$ -dichlor diethyl sulfon                   |                    | Solid          |                     | 203           | Vesicant        |
| 702. | Bis-(ethyl thio ethyl) sulfon                          |                    | Solid          |                     | 64            |                 |
| 703. | $\beta$ -diethyl mercapto diethyl sulfon               |                    | Solid          |                     | 73.7          |                 |
| 704. | Bis-(isobutyl mercapto to ethyl)-sulfon                |                    | Solid          |                     | 94.2          |                 |
| 705. | Bis-(phenoxy ethyl)-sulfon                             |                    | Solid          |                     | 108           |                 |
| 706. | Athyl mercapton  |                    | Liquid         |                     |               |                 |
| 707. | $\beta$ -chlor athyl mercapton                         |                    | Liquid         | 125-6               |               | Vesicant        |
| 708. | $\beta$ -chlor athyl mercapton                         |                    | Liquid         | 50-51               |               |                 |
| 709. | Allyl mercapton  |                    | Liquid         | 90                  |               | Systemic poison |
| 710. | Propyl mercapton                                       |                    | Liquid         | 66-67               |               |                 |
| 711. | Butyl mercapton  |                    | Liquid         | 92-3                |               |                 |
| 712. | $\beta$ -chlor butyl mercapton                         |                    | Liquid         | 61                  |               |                 |
| 713. | $\beta$ -chlor athyl- $\beta$ : mercapton athyl sulfid |                    | Liquid         | 120-127             |               |                 |

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II. Toxic character

694. Toxicity (inhalation): None out of five marmots and one out of five rabbits at 5,000. Lethal dose (hypodermic injection): None out of five die at 20 mg/kg. Vesicant effect on skin: can hardly be noticed.

695. Toxicity (inhalation): Irritating action is weak at 5,000 (rabbit, marmot).

266. Toxicity (inhalation): Irritating action is strong at 5,000 (rabbit, marmot). Lethal dose (hypodermic injection): None out of five rabbits dies at 10 mg/kg.

267. There is no irritating action.

697. As the greater part resolves, it is not effective.

698. Lethal dose: 105 mg/kg. (white mouse).

699. Affects the skin like yperite, but is weaker than yperite.

700. Lethal dose: 175 mg/kg. (white mouse).

703. Lethal dose: 550 mg/kg. (white mouse).

706. Lethal dose (inhalation): Greater than 10,000 (rabbit, marmot).

707. Vesicant effect on skin + lethal dose (hypodermic injection): > 50

708.

709. There is spasmodic contraction and paralysis of the nervous system.

710. Lethal dose (hypodermic injection): > 50 mg/kg. Lethal dose (inhalation): Greater than 10,000 (rabbit, marmot).

Hexamptan odor.



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| 714. | o-amino thio phenol hydrochlorid   | Solid   | 198-200                |         |                      |
|------|------------------------------------|---------|------------------------|---------|----------------------|
| 715. | Diphenyl. sulfid                   | Liquid  | 117 (11mm)             | -24     | Vesicant             |
| 716. | Dicyclohexyl sulfid                | Liquid  | 116-20 (5mm)           |         | Vesicant             |
| 717. | Phs (2-chlor cyclohexyl) sulfid    | Solid   |                        | 72-72.5 | Vesicant             |
| 718. | Arsin wasserstoff                  | Gas     | -113.5                 | -54.3   | Systemic poison      |
| 719. | Trichlor arsin (arsenchlorur)      | Liquid  | 130.2                  | -18     | Vesicant             |
| 719. | Trifluor arsin (arsentrifluorid)   | Liquid  | 64-66                  | -3.5    | Vesicant             |
| 720. | Ethyl. arsin Oxyd                  | Crystal |                        | 9.5     | Vesicant,            |
| 721. | Monomethyl arsin                   | Gas     | 2 (158mm)              |         | Systemic             |
| 722. | Ethyl. dichlor arsin               | Liquid  | 133                    |         | Vesicant             |
| 723. | Ethyl. dibrom arsin                | Liquid  | 170                    |         | Vesicant             |
| 724. | Ethyl. diiod arsin                 | Liquid  | Evaporates at over 200 | 25      | Vesicant             |
| 725. | Kakodylsäure (dimethyl arsinsäure) | Solid   |                        | 200     |                      |
| 726. | Dimethyl arsin Kakodyl wasserstoff | Liquid  | 35.6 (747mm)           |         | Irritant             |
| 727. | Kakodyl chlorid                    | Liquid  | 107                    | ←-45    | Irritant, lacrimator |
| 728. | Kakodyl bromid                     | Oil     | 125                    |         | Irritant             |
| 729. | Kakodyl jodid                      | Liquid  | 154-155                | -35     |                      |
| 730. | Kakodyl cyanid                     | Solid   | 138                    | 33      | Systemic             |
| 731. | Kakodyl fluorid                    | Liquid  |                        |         |                      |
| 732. | Kakodyl rhodanid                   | Oil     | 92 (17mm)              |         | Systemic poison      |
| 733. | Kakodyl trichlorid                 | Solid   |                        | 50      |                      |

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715. There is congestion 5 hours after painting.

716. Vesicant effect on skin: +

727. Vesicant effect on skin: ++

720. Intolerability limit: 5 mg/m<sup>3</sup> plus.

721. Kakodyl odor. There is no irritating action.

725. Comparatively non-toxic and ineffective.

731. Resembles kakodyl chlorid.



|                           |                    | CAS NUMBER     |                 |                |                       |  |
|---------------------------|--------------------|----------------|-----------------|----------------|-----------------------|--|
| Name                      | Structural Formula | Physical state | Boiling point   | Freezing point | Hydrolytic effect     |  |
| 734. Trimethyl arsin      |                    | Liquid         | 51.7-52 (736mm) |                |                       |  |
| 735. Dimethyl arsin       |                    | Liquid         | 157-160         | -5             | Lung injur-           |  |
| 736. Methyl arsin         |                    | Liquid         | 120             | -25            | Irritant              |  |
| 737. Methyl arsin         |                    | Liquid         |                 |                |                       |  |
| 738. Methyl arsin         |                    | Liquid         |                 |                |                       |  |
| 739. Methyl arsin         |                    | Liquid         | 110             | -40            |                       |  |
| 740. Methyl arsin         |                    | Liquid         |                 | 50             |                       |  |
| 741. Triethyl arsin       |                    | Liquid         | 110 (736mm)     |                |                       |  |
| 742. Arseno ethan         |                    | Liquid         |                 |                | Vesicant, irritant    |  |
| 743. Acetyl arsin oxyd    |                    | Liquid         | 153 (760mm)     |                | Vesicant, irritant    |  |
| 744. Acetyl arsin         |                    | Liquid         | 36              |                | Stomachator           |  |
| 745. Acetyl dichlor arsin |                    | Liquid         | 156             |                | Stomachator, irritant |  |
| 746. Acetyl dibrom arsin  |                    | Liquid         | 192             |                | Stomachator           |  |
| 747. Acetyl difluor arsin |                    | Liquid         | 71-72           |                | Irritant              |  |
| 748. Diethyl arsin        |                    | Liquid         | 105             |                |                       |  |
| 749. Diethyl chlor arsin  |                    | Liquid         | 152-152.5       |                | Irritant              |  |
| 750. Diethyl iod arsin    |                    | Liquid         | 70-71 (10mm)    |                | Irritant              |  |
| 751. Diethyl cyan arsin   |                    | Liquid         | 54-56 (760mm)   | -50            | Irritant              |  |

734. Toxic character
735. Toxicity weaker than for arseniureted hydrogen.
736. Lethal dose (skin application): Two out of five die (14 days later) at 20 ng/kg. and two out of five die (3 days later) at 30 ng/kg. Three out of five die (within one day) at 50 ng/kg. Toxicity (inhalation): Rabbits and marmots do not die at ct equals 20,000. Toxicity weaker than for arseniureted hydrogen.
737. Lethal dose (inhalation): Four out of ten marmots and one out of four rabbits die at ct equals 5,000.
738. Lethal dose (inhalation): Three out of five marmots and none out of two rabbits die at ct equals 3,000. Lethal dose (skin application): One out of five dies at 30 ng/kg., and two out of five die at 50 ng/kg. (rabbit).
739. Lethal dose (inhalation): Three out of five marmots and none out of two rabbits die at ct equals 3,000. Lethal dose (skin application): One out of five dies at 30 ng/kg., and two out of five die at 50 ng/kg. (rabbit).
740. Lethal dose (inhalation): Three out of five marmots and none out of two rabbits die at ct equals 3,000. Lethal dose (skin application): One out of five dies at 30 ng/kg., and two out of five die at 50 ng/kg. (rabbit).
741. Lethal dose (inhalation): Three out of five marmots and none out of two rabbits die at ct equals 3,000. Lethal dose (skin application): One out of five dies at 30 ng/kg., and two out of five die at 50 ng/kg. (rabbit).
742. Unpleasant odor.
743. Irritating action is greater than for methyl compounds. Intolerability limit: 5-7 ng/m<sup>3</sup>.
744. Toxic character is strong as with methyl arsin.
745. Vesicant effect on skin:+++ Lethal dose (skin application): Two out of three die at 10 ng/kg., and three out of three die at 20 ng/kg. Toxicity (inhalation): None out of five marmots dies at ct equals 500-5,000.
746. Irritating action is weaker than that of acetyl dichlor arsin.
747. Toxicity (inhalation): None out of five marmots dies at ct equals 4,000. Lethal dose (hypodermic injection): One out of two dies at 3 ng/kg. and 4 ng/kg.
748. Lethal dose (inhalation): One out of three rabbits dies at ct equals 10,000, and two out of five die at 15,000. Vesicant effect on skin: Though acute in nature, it is much weaker than No. 2 by comparison.
749. Lethal dose (inhalation): None out of three rabbits dies at ct equals 10,000, and two out of five die at 15,000. Lethal dose (skin application): One out of five dies at 15 ng/kg. and at 30 ng/kg. Two out of five die at 50 ng/kg. Vesicant effect on skin: Though acute in nature, it is much weaker than No. 2 by comparison.
750. Lethal dose (inhalation): One out of three rabbits dies at ct equals 10,000, and four out of five die at 15,000. Lethal dose (skin application): One out of five dies at 15 ng/kg., two out of five dies at 30 ng/kg., and five out of five die at 50 ng/kg. Vesicant effect on skin: Though acute in nature, it is much weaker than No. 2 by comparison.



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CLASSIFICATION

| No.  | Name  | Structural formula | Physical state | Boiling point | Melting point | Physiological effect  |
|------|---|--------------------|----------------|---------------|---------------|-----------------------|
|      | arsin   |                    | (Liquid)       | -27<br>(5.5m) |               |                       |
| 758. | Dichlor arsin<br>oossigsauo                         |                    | Crystal        |               | 123-125       |                       |
| 759. | $\beta$ -chlor vinyl<br>arsin oxyd                  |                    | Solid          |               | 116-3         | Vesicant              |
| 759. | $\beta$ -chlor vinyl<br>arsinsauo                   |                    | Solid          |               | 130           |                       |
| 759. | $\beta$ -chlor vinyl<br>arsenige sauro              |                    | Liquid         |               |               | Vesicant              |
| 759. | $\beta$ -chlor vinyl<br>dichlor arsin               |                    | Liquid         | 139           | -13           | Vesicant              |
| 759. | $\beta$ -chlor vinyl<br>dibrom arsin                |                    | Liquid         | 94<br>(11m)   |               | Vesicant              |
|      | $\beta$ -chlor vinyl<br>dijod arsin                 |                    | Liquid         |               | 71.5<br>38.5  | Vesicant              |
| 760. | $\beta$ -chlor vinyl<br>difluor arsin               |                    | Liquid         | 53<br>(25m)   | -27           | Vesicant              |
| 761. | $\beta\beta'$ -dichlor divinyl<br>arsin chlorid     |                    | Liquid         | 231           |               | Vesicant              |
| 762. | $\beta\beta'$ -dichlor divinyl<br>arsin cyanid      |                    | Liquid         |               |               |                       |
| 763. | $\beta\beta'\beta''$ -trichlor vinyl<br>arsin       |                    | Liquid         | 259           | 3-4           | Vesicant,<br>irritant |
| 764. | $\beta$ -chlor vinyl<br>diethoxy arsin              |                    | Liquid         |               |               |                       |
| 765. | $\beta\beta'$ -dichlor divinyl<br>ethoxy arsin      |                    | Liquid         |               |               |                       |
| 766. | Tri( $\beta$ -chlor vinyl)<br>methyl arsonium jodid |                    | Solid          |               | 209           |                       |
| 767. | His( $\beta$ -chlor vinyl)<br>arsenige sauro        |                    | Solid          |               | 62-63         | Vesicant              |
| 768. | $\beta$ -dichlor divinyl<br>arsin bromid            |                    |                |               |               |                       |
| 769. | $\beta$ -dichlor divinyl<br>arsin rhodanid          |                    |                |               |               |                       |
|      | $\beta$ -chlor vinyl<br>dichlor arsin               |                    |                |               |               |                       |

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## Toxic character

752. Lethal dose (inhalation): None out of three rabbits dies at 5,000 to 10,000. Lethal dose (skin application): One out of three dies at 30 ng/kg., and two out of five dies at 50 ng/kg.
753. Lethal dose (hypodermic injection): None out of five dies at 5 ng/kg. to 10 ng/kg. This agent is much weaker than known military gases.
754. Lethal dose (hypodermic injection): >20 ng/kg. (rabbit). Lethal dose (skin application): >20 ng/kg. (rabbit.)
756. Vesicant effect on skin: Resembles lewisite. Lethal (hypodermic injection): Two out of three rabbits die at 5 ng/kg. Lethal dose (skin application): One out of three rabbits dies at 5 ng/kg.
757. Vesicant effect on skin: \*\* Lethal dose (skin application): 3-5 ng/kg. 100% die at 3 ng/kg. Lethal dose (hypodermic injection): 100% die (7 days later) at 3 ng/kg. Lethal dose (inhalation): 50% of mammals die at or equals 2,000.
758. Vesicant effect on skin: \*\* Lethal dose (skin application): 5 ng/kg. (minimum) (Rabbit). Skin damaging action: somewhat inferior to lewisite.
759. Vesicant effect on skin: \*\* Lethal dose (skin application): 5 ng/kg. (minimum) (Rabbit). Skin damaging action: somewhat inferior to lewisite.
760. Lethal dose (hypodermic injection): 60% die at 3 ng/kg., 80% die at 5 ng/kg., and 100% die at 7 ng/kg. Lethal dose (skin application): 30% die at 3 ng/kg., 80% die at 5 ng/kg., and 100% die at 7 ng/kg.
761. Vesicant effect on skin: \*\* Although it is inferior to lewisite in this respect, it has superior irritating power on the respiratory system. Lethal dose (skin application): 100 ng/kg. (rabbit).
- Lethal dose (skin application): 200 ng/kg. (rabbit). Skin damaging action is very weak when compared to lewisite.
- Lethal dose (inhalation): One out of five mammals and no rabbits die at or equals 2,000. Lethal dose (skin application): One out of five dies at 5-10 ng/kg., two out of five die at 15 ng/kg., and four out of five die at 20 ng/kg. Lethal dose (hypodermic injection): Four out of five die at 15 ng/kg. The toxic character of this agent is slightly stronger than for  $\text{ClO}_2$  but weaker than for No. 2.



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(When Stamp)  
JUL 12 1950

REGISTRY NUMBER

| No.  | Name  | Structural<br>Formula | Physical<br>state | Boiling<br>point                      | Melting<br>point | Physiological<br>effect |
|------|---|-----------------------|-------------------|---------------------------------------|------------------|-------------------------|
| 771. | $\beta$ -hydroxy ethyl di-<br>arsin                 |                       | Liquid            |                                       | -30              | Vesicant                |
| 772. | $\beta$ -chlor ethyl di-<br>chlor arsin             |                       | Liquid            | 92-3<br>(32mm)                        |                  | Vesicant                |
| 773. | $\beta$ -chlor ethyl di-<br>brom arsin              |                       | Liquid            | 125<br>(27mm)                         | -50              | Vesicant                |
| 774. | $\beta$ -chlor ethyl dichlor<br>arsin C             |                       | Liquid            | 55-72<br>(11mm)                       | -50              | Vesicant                |
| 776. | Allyl dichlor arsin                                 |                       | Liquid            | 166                                   | Under            | Vesicant                |
| 777. | n-propyl dichlor<br>arsin                           |                       | Liquid            | 168-169                               | -26              | Vesicant                |
| 778. | n-propyl difluor<br>arsin                           |                       | Liquid            | 30-33                                 |                  | Vesicant                |
| 779. | $\beta,\gamma$ -dihydroxy pro-<br>pyl dichlor arsin |                       | Liquid            | Resolves<br>by dis-<br>tilla-<br>tion |                  | Vesicant                |
| 780. | $\beta,\gamma$ -dichlor propyl<br>dichlor arsin     |                       | Liquid            | 120-130                               |                  | Vesicant                |
| 781. | n-butyl arsin oxyd                                  |                       | Liquid            | 129<br>(14mm)                         |                  | Vesicant                |

## No. Toxic character

771. Lethal dose (skin application): Two out of five die at 15 mg/kg and 100 percent die at 30-50 mg/kg. Lethal dose (hypodermic injection): Two out of five die at 15 mg/kg and five out of five die at 30 mg/kg. The toxic character of this agent is practically the same as the toxic character of other chlorides.
772. Lethal dose (skin application): Two out of three die at 10 mg/kg, one out of three dies at 30 mg/kg, and two out of three die at 50 mg/kg. Lethal dose (hypodermic injection): Two out of three die at 10 mg/kg and three out of three die at 20 mg/kg. This agent has weaker skin-damaging action than methyl dichloroarsine and ethyl dichloroarsine.
773. Lethal dose (skin application): One out of two dies at 10 mg/kg and one out of two die at 40-50 mg/kg. Lethal dose (hypodermic injection): One out of four dies at 10 mg/kg, three out of four die at 15 mg/kg, and two out of two die at 30 mg/kg. Skin-damaging action is stronger than that of Lewisite. It is stronger than No. 1, and the damage seems to go deeper. It is somewhat weaker than ethyl difluoroarsine.
774. Lethal dose (skin application): One out of five dies at 5 mg/kg - 10 mg/kg; two out of five die at 30 mg/kg; and five out of five die at 50 mg/kg (rabbit). Toxic character is somewhat weaker than that of chloroarsine.
775. Lethal dose (skin application): Four out of ten die at 10 mg/kg. Vesicant effect on skin: Vesicant action is similar to that of No. 2, but its effect is somewhat weaker.
776. Lethal dose (inhalation): Two out of five marmosets and none out of five rabbits die at ct equals 2,000. Lethal dose (skin application): Two out of ten die at 3 mg/kg and two out of five die at 5 mg/kg. Lethal dose (hypodermic injection): Two out of five die at 2 mg/kg and four out of five die at 3 mg/kg. Vesicant effect on skin is somewhat stronger than No. 2, but its toxic character is inferior. Almost the same as No. 2.
777. Lethal dose (inhalation): One out of five marmosets and no rabbits die at ct equals 2,000 and at ct equals 5,000. Lethal dose (skin application): 40 percent die at 3-5 mg/kg and four out of five at 10 mg/kg. Lethal dose (hypodermic injection): Two out of five die at 2 mg/kg and four out of five die at 3 mg/kg.
778. Toxicity (inhalation): Rabbits and marmosets do not die at ct equals 2,000-5,000. Lethal dose (skin application): Two out of five rabbits die at 10 mg/kg and at 30 mg/kg. Lethal dose (hypodermic injection): One out of five rabbits die at 5 mg/kg and three out of five die at 15 mg/kg. Vesicant effect on skin is almost identical to that of trichloroarsine.
779. Toxicity (inhalation): One out of five marmosets and none out of five rabbits die at ct equals 2,000 and at ct equals 5,000. Lethal dose (skin application): One out of five die at 10-20 mg/kg. The skin-damaging action and vesicant effect on skin is almost identical to that of trichloroarsine.
780. Lethal dose (skin application): Two out of five die at 3 mg/kg, four out of five die at 5 mg/kg, and five out of five die at 10-15 mg/kg. Lethal dose (hypodermic injection): Three out of ten die at 2 mg/kg and five out of five die at 3 mg/kg - 10 mg/kg (acute death). Vesicant effect: moderate strength. The toxic character of this agent resembles that of chloroarsine. The lethal effect is about the same, but its vesicant effect is slightly inferior.



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(Classification Stamp)  
DO NOT USE FOR DISSEMINATION

| No.  | Name                                    | REGISTRY NUMBER       |                   | Boiling<br>point | Melting<br>point | Physiological<br>effect |
|------|---|-----------------------|-------------------|------------------|------------------|-------------------------|
|      |   | Structural<br>formula | Physical<br>state |                  |                  |                         |
| 762. | N-butyl dichloroarsine                  |                       | Liquid            | 159-160          |                  | Vesicant                |
| 763. | N-butyl dichloroarsine                  |                       | Liquid            | 192-194          | -90              | Vesicant                |
| 764. | Isobutyl dichloroarsine                 |                       | Liquid            | 95.8<br>(50mm)   |                  | Vesicant                |
| 765. | Isobutyl difluoroarsine                 |                       | Liquid            | 40-41            |                  | Vesicant                |
| 766. | Isobutyl dichloroarsine                 |                       | Liquid            | 124-127          |                  | Vesicant                |
| 767. | Isobutyl dibromoarsine                  |                       |                   |                  |                  |                         |
| 768. | Isobutyl dichloroarsine propylene-oxide |                       | Liquid            | 41-55<br>(7mm)   |                  | Vesicant                |
| 769. | Sym dichloro diarsine propyl chloride   |                       | Liquid            | 47-48<br>(27mm)  | Under<br>-50     | Vesicant                |
| 770. | Methoxy dichloroarsine                  |                       | Liquid            | 130-131          |                  |                         |
| 771. | Dimethoxy chloroarsine                  |                       | Liquid            | 120              |                  |                         |
| 772. | Methoxy dibromoarsine                   |                       | Liquid            | 175-176          |                  |                         |
| 773. | Dimethoxy bromoarsine                   |                       | Liquid            | 155-158          |                  |                         |
| 774. | Aethoxy dichloroarsine                  |                       | Liquid            | 145.5-<br>147.5  |                  |                         |

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- | No.  | Toxic character   |
|------|---|
| 782. | Lethal dose (skin application): Two out of three rabbits die at 20 mg/kg. Vesicant action: Weaker than for $C_4H_9AsCl_2$ and much weaker than for $C_2H_5AsCl_2$ . Lethal dose (hypodermic injection): Two out of five die at 5 mg/kg.   |
| 783. | Vesicant effect on skin: <del>Weak</del> Lethal dose (skin application): Seven out of nine die at 2 mg/kg (Mokamoto). Lethal dose (inhalation): 20 percent of marmots die at ct equals 2,000. Lethal dose (hypodermic injection): Four out of ten die at 1 mg/kg.   |
| 784. | Lethal dose (inhalation): One out of five marmots and none out of ten rabbits die at ct equals 3,000 and at ct equals 5,000. Lethal dose (skin application): Two out of five die at 2 mg/kg, four out of five die at 5 mg/kg, and five out of five die at 10 mg/kg. Slightly inferior to known military gases.      |
| 785. | Lethal dose (inhalation): ct equals over 5,000. Lethal dose (skin application): Seven out of ten die at 5 mg/kg. Lethal dose (hypodermic injection): One out of five dies at 1 mg/kg, three out of five die at 5 mg/kg, and five out of five die at 5 to 10 mg/kg. Slightly inferior to other known military gases. |
| 786. | Toxicity (inhalation): One out of five marmots and no rabbits die at ct equals 10,000. Lethal dose (skin application): One out of five dies at 10 mg/kg and two out of five die at 15 mg/kg. Slightly weaker than known military gases.   |
| 787. |   |
| 788. | Lethal dose (skin application): None out of five rabbits die at 5 mg/kg and at 10 mg/kg. Lethal dose (hypodermic injection): One out of five dies at 5 mg/kg and two out of five die at 10 mg/kg. Vesicant effect on skin: Vesicant effect resembles that of No. 2 but is less effective.                           |
| 789. |   |
| 790. | Toxicity (inhalation): None out of twenty marmots dies at ct equals 2,000 and none out of ten dies at 6,000. Irritating action is weak. Vesicant effect is much weaker than that of No. 2.  |
| 791. | Toxicity (inhalation): None out of ten marmots dies at ct equals 2,000 and at 6,000. Irritating action is weak. Vesicant effect is much weaker than that of No. 2.  |
| 792. | Toxicity (inhalation): None out of ten marmots dies at ct equals 2,000 and at 6,000. Irritating action is very weak. Vesicant effect is markedly inferior.  |
| 793. | Toxicity (inhalation): None out of ten marmots dies at ct equals 2,000 and one out of ten dies at 6,000. Irritating action is very weak. (Comparison with diphenyl chlor arsin). Vesicant effect is markedly inferior.  |
| 794. | Toxicity (inhalation): None out of five marmots dies at ct equals 1,500 and at 5,000. Irritating action is weak. Vesicant effect is markedly inferior.  |

RESTRICTED



RESTRICTED

(Classification Stamp)

OS ID USA TRANSLATION

REGISTRY NUMBER

| No. | Name                                       | Structural<br>formula | Physical<br>state | Boiling<br>point | Melting<br>point | Physiological<br>effect |
|-----|--|-----------------------|-------------------|------------------|------------------|-------------------------|
| 785 | Diaethoxy chlor arsin                      |                       | Liquid            | 159-160          |                  |                         |
| 786 | Aethoxy dibrom arsin                       |                       | Liquid            | 150-192          |                  |                         |
| 787 | Diathoxy brom arsin                        |                       | Liquid            | 178-180          |                  |                         |
| 788 | Glycoxy chlor arsin                        |                       | Crystal           | 63-65<br>(2mm)   | 41.5-<br>43      |                         |
| 789 | Glycoxy brom arsin                         |                       | Crystal           | 82-85<br>(4mm)   | 43-45            |                         |
| 800 | Methyl arsin selenid                       |                       | Crystal           |                  | 105-107          |                         |
| 801 | Methyl arsin sulfid                        |                       | Solid             |                  | 110              |                         |
| 802 | Methyl arsin disulfid                      |                       | Solid             |                  |                  |                         |
| 803 | Aethyl arsin disulfid                      |                       | Liquid            |                  |                  |                         |
| 804 | Propyl arsin disulfid                      |                       | Liquid            |                  |                  |                         |
| 805 | Butyl arsin sulfid                         |                       | Liquid            |                  |                  | Vesicant                |
| 806 | Iso amyl arsin disulfid                    |                       | Liquid            |                  |                  |                         |
| 874 | $\beta$ -chlor vinyl arsin<br>sulfid       |                       | Liquid            |                  |                  | Vesicant                |
| 875 | $\beta$ -chlor vinyl arsin<br>disulfid     |                       |                   |                  |                  |                         |
| 888 | $\beta$ -chlor athyl arsin<br>sulfid       |                       | Solid             |                  |                  |                         |
| 889 | $\beta$ -chlor athyl arsin<br>disulfid     |                       | Solid             |                  |                  |                         |
| 890 | Hydroxy athyl thio<br>dichlor arsin        |                       | Liquid            |                  |                  | Vesicant                |
| 891 | $\beta$ -chlor athyl thio<br>dichlor arsin |                       | Liquid            |                  |                  | Vesicant                |
| 912 | Dimethyl arsin athyl<br>sulfid             |                       | Liquid            | 151              |                  |                         |

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## No. Toxic character

795. Toxicity (inhalation): None out of five marmosets die at et equals 1,500 and at 5,000. Irritating action is weak. Vesicant effect is markedly inferior. Slightly inferior to  $C_2H_5OAsCl_2$ .

796. Toxicity (inhalation): None out of ten marmosets die at et equals 1,500 and at 5,000. Compared with military gases, both irritating and vesicant effects are markedly inferior.

797. Toxicity (inhalation): None out of ten marmosets die at et equals 1,500 and at 5,000. Compared with military gases, both irritating and vesicant effects are markedly inferior.

798. Toxicity (inhalation): None out of ten marmosets die at et equals 1,500 and at 3,000.

799. Toxicity (inhalation): None out of ten marmosets die at et equals 1,500, at 1,500, and at 3,000.

800.

801. Irritating action is weak, but toxic action is great.

802. Toxicity (inhalation): None out of five marmosets and none out of two rabbits die at et equals 10,000. Toxicity (skin application): One out of five rabbits dies at 10, 20, and 40 mg/kg respectively. Two out of five die at 50 mg/kg.

803. Toxicity (inhalation): None out of five marmosets and none out of two rabbits die at et equals 10,000. Lethal dose (skin application): One out of five rabbits dies at 30 mg/kg and at 50 mg/kg.

804. Toxicity (inhalation): One out of five marmosets and none out of two rabbits die at et equals 10,000. Lethal dose (skin application): One out of five dies at 40 mg/kg.

805.

806. Lethal dose (skin application): One out of five rabbits dies at 40 mg/kg.

807. Toxicity effect on skin: No. Lethal dose (skin application): 40 mg/kg (rabbit). Skin damaging action: Considerably weaker when compared to No. 2.

808.

809. Lethal dose (skin application): None out of five dies at 40 mg/kg.

810. Lethal dose (skin application): None out of five dies at 40 mg/kg.

811. Lethal dose (skin application): One out of three die at 20 mg/kg. Lethal dose (hypodermic injection): Three out of three die at 20 mg/kg.

812. Lethal dose (skin application): None out of three die at 20 mg/kg. Lethal dose (hypodermic injection): Three out of three die at 20 mg/kg.

813. There is no irritating effect.



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REGISTRY NUMBER

10

|      | Structural<br>Formula            | Physical<br>state | Boiling<br>point | Melting<br>point | Crystallization<br>effect |
|------|----------------------------------|-------------------|------------------|------------------|---------------------------|
|      | Bis-(diethyl arsin)<br>sulfid    | Liquid            | 118-119<br>(5mm) |                  | Irritant                  |
| 814. | Phenyl arsin oxyd                | Solid             |                  | 119-120          | Vesicant                  |
| 815. |                                  |                   |                  |                  |                           |
|      | Phenyl arsinsäure                | Solid             |                  |                  | Vesicant                  |
| 817. | Phenyl dichlor arsin             | Liquid            | 252-259          | -50              | Vesicant                  |
| 818. | Phenyl arsin                     | Liquid            | 143              |                  | Vesicant                  |
| 819. | Phenyl dibrom arsin              | Liquid            | 265              | -46.5            | Vesicant                  |
| 820. | Phenyl diäthan arsin             | Solid             |                  | 79-80            | Vesicant                  |
| 821. | Phenyl diäthyl arsin             | Crystal           | 185<br>(10mm)    | 15               | Vesicant                  |
| 822. | Phenyl difluor arsin             | Liquid            |                  | 27-28            | Vesicant                  |
| 823. | O-chlor phenyl arsin-<br>säure   | Solid             |                  | 181              |                           |
| 824. | m-chlor phenyl arsin-<br>säure   | Solid             |                  | 168              |                           |
| 825. | p-chlor phenyl arsin-<br>säure   | Solid             |                  | Over<br>260      |                           |
| 826. | O-chlor phenyl dichlor<br>Arsin  | Crystal           | 275-<br>278      | 45.7             | Vesicant                  |
| 827. | m-chlor phenyl dichlor<br>arsin, | Liquid            | 273-275          | <-20             | Vesicant                  |

RESTRICTED

70. Toxic character
813. Toxicity (inhalation): One out of five dies at ct equals 2,000 and two out of five die at 5,000. Lethal dose (skin application): One out of five dies at 30 mg/kg.
814. Vesicant effect on skin:  $\pm$  Lethal dose (hypodermic injection): One out of three rabbits dies at 3 mg/kg. Intolerability limit: 10 mg/kg. Lethal dose (skin application): 70 percent of rabbits die at 3 mg/kg.
- 815.
816. Much weaker than  $\text{C}_6\text{H}_5\text{AsCl}_2$  (skin damaging action). Lethal dose (hypodermic injection): over 30 mg/kg.
817. Lethal dose (inhalation): One out of five marmots dies at ct equals 1,000. Four out of five marmots die at ct equals 2,000. Lethal dose (skin application): Four out of five die at 5 mg/kg and 100 percent die at 10 mg/kg (estimated). Lethal dose (hypodermic injection): None out of three dies at 1 mg/kg and three out of three die at 3 mg/kg. Vesicant effect on skin:  $\pm$
818. Strongly irritates the mucous membranes.
819. Toxicity (inhalation): Nine out of twenty marmots and none out of two rabbits die at ct equals 2,000. Lethal dose (skin application): Eight out of ten die at 5 mg/kg. Lethal dose (hypodermic injection): Three out of ten die at 3 mg/kg.
820. Toxicity (inhalation): Six out of twenty marmots and none out of two rabbits die at ct equals 2,000. Lethal dose (skin application): One out of ten dies at 5 mg/kg. Lethal dose (hypodermic injection): Five out of ten die at 3 mg/kg. Vesicant effect on skin: Toxicity somewhat inferior to phenyl dibrom arsenic.
821. Toxicity (inhalation): One out of five marmots and none out of two rabbits die at ct equals 2,000. Lethal dose (skin application): Two out of five die at 5 mg/kg. Toxic character is about the same as that of  $\text{C}_6\text{H}_5\text{AsCl}_2$ .
822. Lethal dose (inhalation): ct equals 1,000. Lethal dose (skin application): One out of five dies at 10 mg/kg. Lethal dose (hypodermic injection): One out of five die at 1 mg/kg and five out of five die at 3 mg/kg.
- 823.
824. Lethal dose (inhalation): 20 percent of marmots die at ct equals 500. Lethal dose (skin application): Three out of five die at 5 mg/kg. Lethal dose (hypodermic injection): Three out of three rabbits die (three days later) at 3 mg/kg.
- 825.
826. Lethal dose (inhalation): 25 percent die at ct equals 250, 50 percent at 300, and 94 percent at ct equals 1,000. Lethal dose (skin application): One out of five dies at 1 mg/kg. Lethal dose (hypodermic injection): One out of three dies at 1 mg/kg and three out of three die at 3 mg/kg.



# RESTRICTED

(Ink Stamp)  
 15 JAN 1970

REGISTRY NUMBER

DATE

57

| No. | Name                              | Structural<br>Formula | Physical<br>State | Boiling<br>point  | Melting<br>point       | Physiological<br>effects |
|-----|-----------------------------------|-----------------------|-------------------|-------------------|------------------------|--------------------------|
| 228 | p-chlor phenyl di-<br>chlor arsin |                       | Liquid            | 176-177<br>(23mm) |                        | Vesicant                 |
| 229 | o-brom phenyl arsin-<br>saur      |                       | Solid             |                   | 201                    |                          |
| 230 | m-brom phenyl arsin-<br>saur      |                       | Solid             |                   | 151-152                |                          |
| 231 | p-brom phenyl arsin-<br>saur      |                       | Solid             |                   |                        |                          |
| 232 | o-brom phenyl dichlor<br>arsin    |                       | Liquid            | 174-175<br>(23mm) |                        | Vesicant                 |
| 233 | m-brom phenyl dichlor<br>arsin    |                       | Liquid            | 178<br>(23mm)     | 1.5                    | Vesicant                 |
| 234 | p-brom phenyl dichlor<br>arsin    |                       | Liquid            | 187<br>(33mm)     | 8.5                    |                          |
| 235 | p-chlor phenyl dibrom<br>arsin    |                       | Liquid            | 180-181<br>(10mm) |                        | Vesicant                 |
| 236 | p-brom phenyl dibrom<br>arsin     |                       | Liquid            | 193-199<br>(12mm) |                        | Vesicant                 |
| 237 | o-tolyl arsinsaur                 |                       | Solid             |                   | 160                    |                          |
| 238 | m-tolyl arsinsaur                 |                       | Solid             |                   | 150                    |                          |
| 239 | p-tolyl arsinsaur                 |                       | Solid             |                   | 200<br>(re-<br>solves) |                          |
| 240 | o-tolyl dichlor<br>arsin          |                       | Liquid            | 264               |                        | Vesicant                 |
| 241 | m-tolyl dichlor arsin             |                       | Liquid            | 270               |                        | Vesicant                 |
| 242 | p-tolyl dichlor arsin             |                       | Solid             | 267               | 31                     | Vesicant                 |
| 243 | p-tolyl dibrom arsin              |                       | Liquid            | 170-171<br>(18mm) |                        | Vesicant                 |
| 244 | o-nitro phenyl arsin-<br>saur     |                       | Solid             |                   |                        |                          |
| 245 | m-nitro phenyl arsin-<br>saur     |                       | Solid             |                   |                        |                          |
| 246 | p-nitro phenyl arsin-<br>saur     |                       | Solid             |                   |                        |                          |
| 247 | o-nitro phenyl dichlor<br>arsin   |                       | Solid             |                   | 43-44                  | Vesicant                 |
| 248 | m-nitro phenyl dichlor<br>arsin   |                       | Crystal           |                   | 33-34                  | Vesicant                 |

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## No. Toxic character

827. Lethal dose (inhalation): 30 percent die at et equals 500. Lethal dose (skin application): Four out of five die at 5 mg/kg. Lethal dose (hypodermic injection): One out of three die at 1 mg/kg and three out of three die at 3 mg/kg. Vesicant action: About the same as phenyl dichlor arsin.

828.

829.

830.

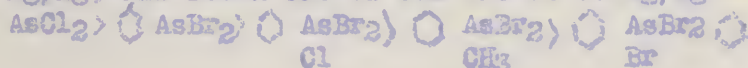
831. Lethal dose (inhalation): 30 percent die at et equals 500 (estimated).

832. Lethal dose (inhalation): 75 percent die at et equals 500.

833. Lethal dose (inhalation): 57 percent of marmots die at et equals 500.

834. Lethal dose (skin application): Five out of fifteen die at 5 mg/kg and four out of five die at 10 mg/kg.

835. Lethal dose (skin application): One out of five die at 10 mg/kg and 20 mg/kg, and seven out of ten die at 30 mg/kg.



837.

838.

839.

840. Lethal dose (inhalation): 30 percent of marmots die at et equals 500.

841. Lethal dose (inhalation): 40 percent of marmots die at et equals 500.

842. Lethal dose (inhalation): 50 percent of marmots die at et equals 500.

843. Lethal dose (skin application): One out of fifteen die at 5 mg/kg and four out of five die at 10 mg/kg.

844.

845.

846.

847. Lethal dose (inhalation): 100 percent of marmots die at et equals 250. Lethal dose (skin application): One out of two dies 5 mg/kg. Lethal dose (hypodermic injection): Two out of three die at 1 mg/kg. Vesicant effect on skin:  $\frac{1}{4}$ . Slightly weaker than "meta" and "para" compounds.

848. Lethal dose (inhalation): 10 percent of marmots die at et equals 150, 60 percent die at et equals 250, and 75 percent die at et equals 500. For rabbits it is over 1,000. Lethal dose (skin application): None out of two die at 5 mg/kg, and two out of two die at 10 mg/kg. Lethal dose (hypodermic injection): One out of three dies at 1 mg/kg and three out of three die at 3 mg/kg.

UNCLASSIFIED



| Chemical Name |                                       | Registry Number |                      | CAS No.              |                     |
|---------------|---------------------------------------|-----------------|----------------------|----------------------|---------------------|
|               | Structural Formula                    | Physical state  | Boiling point        | Melting point        | Biological activity |
|               | p-nitro phenyl dichlor arsin          | Liquid          | 207<br>(17mm)        |                      | Vesicant            |
| 850.          | m-nitro phenyl dibrom arsin           | Crystal         |                      | 64-64.5              | Vesicant            |
| 851.          | p-methoxy phenyl dichlor arsin        |                 |                      |                      |                     |
| 852.          | p-chlor sulfonyl phenyl dichlor arsin | Solid           |                      | 360<br>(sublimation) |                     |
| 853.          | p-amino phenyl arsin-<br>saur         | Solid           |                      |                      |                     |
| 854.          | p-dichlor arsin benzyl chlorid        | Liquid          | 187-189<br>(10-12mm) |                      |                     |
| 855.          | 2,4-dichlor phenyl<br>arsinsaur       | Solid           |                      |                      |                     |
| 856.          | 2,5-dichlor phenyl<br>diarsin         | Solid           |                      | 76.5-<br>97          |                     |
| 857.          | 2,4-dichlor phenyl<br>arsinsaur       | Solid           |                      |                      |                     |
| 858.          | 2,5-dichlor phenyl<br>arsinsaur       | Solid           |                      | 212-213              |                     |
| 859.          | 2,4 dichlor phenyl<br>dichlor arsin   | Liquid          | 176-177<br>(23mm)    |                      | Vesicant            |
| 860.          | 2,5-dichlor phenyl                    | Liquid          | 179-180<br>(27mm)    | 57.4                 | Vesicant            |
| 861.          | Benzyl dichlor arsin                  | Liquid          | 168-172<br>(50mm)    | -70                  | Vesicant            |
| 862.          | m-xylyl dichlor arsin                 | Solid           | 278                  | 45                   |                     |
| 863.          | p-xylyl dichlor arsin                 | Solid           | 265                  | 63                   |                     |
| 864.          | Dimethyl phenyl arsin                 | Liquid          | 200                  |                      |                     |
| 865.          | Diethyl phenyl arsin                  | Oil             | 240                  |                      |                     |
| 866.          | Phenyl methyl chlor<br>arsin          | Liquid          | 229-230              |                      | Vesicant            |
| 867.          | Phenyl .p. chlor vinyl<br>chlor arsin | Liquid          | 140-145<br>(10mm)    |                      | Irritant            |
| 868.          | Phenylarsinsaur di-<br>ethyl ester    | Liquid          | 168-170<br>(15mm)    |                      |                     |

Dissemination Form for ID Translations

## No. Toxic character

129. Lethal dose (inhalation): 10 percent die at ct equals 150, 13 percent die at ct equals 250, and 85 percent die at ct equals 500. Lethal dose (skin application): One out of two dies at 5 mg/kg and two out of two die at 10 mg/kg. Lethal dose (hypodermic injection): One out of three dies at 1 mg/kg and three out of three die at 3 mg/kg.
130. Lethal dose (inhalation): One out of five die at ct equals 250, 7 out of ten die at ct equals 500, and seven out of ten die at ct equals 1,000.
- 131.
132. Toxicity (inhalation): Rabbits and marmots do not die at ct equals 10,000. Irritating action is not apparent.
- 133.
- 134.
- 135.
- 136.
137. Lethal dose (skin application): One out of four rabbits die at ct equals 500.
- 138.
139. Vesicant effect on skin: Lethal dose (skin application): One out of three die at 35 mg/kg and three out of three die at 50 mg/kg. Lethal dose (hypodermic injection): One out of three dies at 1 mg/kg and three out of three die at 2.5 mg/kg. Lethal dose (inhalation): 20 percent die at ct equals 500 and 93 percent die at ct equals 1,000 (marmot).
140. Vesicant effect on skin: Lethal dose (skin application): One out of three dies at 35 mg/kg and three out of three die at 50 mg/kg. Lethal dose (hypodermic injection): One out of three dies at 1 mg/kg and three out of three die at 2.5 mg/kg. Lethal dose (inhalation): 40 percent die at ct equals 500 and 87 percent die at ct equals 1,000 (marmot).
141. Toxicity (inhalation): None out of five marmots and none out of two rabbits die at ct equals 5,000. Lethal dose (skin application): None out of five dies at 3 mg/kg and one out of five dies at 5 mg/kg. Lethal dose (hypodermic injection): Two out of five die at 5 mg/kg.

Very disgusting odor.

Resembles phenyl dichloro arsin.

Lethal dose (inhalation): None out of ten marmots dies at ct equals 1,500, two out of ten die at 2,000, and seven out of ten die at 4,500. Vesicant action is not inferior to that of No. 2.



Structural

Physical

Boiling

Melting

Biological

| 868. | Phenyl methoxy chlor arsin        | Liquid  | 92-93<br>(4mm)                             |               |                          |
|------|-----------------------------------|---------|--|---------------|--------------------------|
| 870. | Phenyl methoxy brom arsin         | Liquid  | 100-105<br>(35mm)                          |               |                          |
| 871. | Phenyl athoxy chlor arsin         | Liquid  | 108-110<br>(7mm)                           |               |                          |
| 872. | Phenyl athoxy brom arsin          | Liquid  | 105-106<br>(35mm)                          |               |                          |
| 873. | m-nitrophenyl methoxy chlor arsin | Liquid  | 155-156<br>(4mm)                           |               |                          |
| 874. | m-nitrophenyl athoxy chlor arsin  | Liquid  | 159-161                                    |               |                          |
| 875. | <i>L</i> -naphthyl arsinsaeure    | Solid   |  | 197           |                          |
| 876. | <i>B</i> -naphthyl arsinsaeure    | Solid   |  | 155           |                          |
| 877. | <i>L</i> -naphthyl dichlor arsin  | Solid   | 180<br>(5mm)                               | 68            | Vesicant                 |
| 878. | <i>B</i> -naphthyl dichlor arsin  | Solid   |  | 69            | Vesicant                 |
| 879. | <i>B</i> -naphthyl dibrom arsin   | Solid   |  | 73            | Vesicant, irritant       |
| 880. | <i>L</i> -naphthyl dicyan arsin   | Solid   |  | 160.5-<br>161 | Vesicant, irritant       |
| 881. | <i>B</i> -naphthyl dicyan arsin   | Solid   |  | 165           | Irritant                 |
| 882. | Diphenyl arsinsaeure              | Solid   |  | 174           |                          |
| 883. | Diphenyl arsin                    |         | 174  |               | Stomach poison           |
| 884. | Diphenyl chlor arsin              | Crystal | 333<br>(CO <sub>2</sub><br>air<br>current) | 38            | Stomach poison           |
| 885. | Diphenyl brom arsin               | Solid   | Over<br>300                                | 54            | Stomach poison, irritant |
| 886. | Diphenyl iod arsin                | Solid   | 204-218<br>(12mm)                          | 45-46         |                          |

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DISSEMINATION NUMBER

CLASSIFICATION

10. Toxic character

666. Toxicity (inhalation): 20 percent of marmots die at ct equals 1,000 and 70 percent die at 1,500.

670. Toxicity (inhalation): 10 percent of marmots die at ct equals 1,000 and 80 percent die at 1,500 and 3,000.

671. Lethal dose (inhalation): 30 percent of marmots die at ct equals 1,700, 50 percent die at 1,500, and 70 percent die at 3,000.

672. Lethal dose (inhalation): 10 percent of marmots die at ct equals 1,000, 30 percent die at 1,500, and 60 percent die at 3,000.

673. Lethal dose (inhalation): 90 percent of marmots die at ct equals 1,000, at 1,500, and at 3,000. Rabbits and pigeons do not die.

674. Lethal dose (inhalation): 30 percent of marmots die at ct equals 1,000,

675.

676.

677. Lethal dose (inhalation): Marmots to 50% die at ct equals 300. Those out of five die at 1,000. Skin damaging action: slightly stronger than  $C_6H_5Cl_2$ .

678. Lethal dose (inhalation): 20 percent of marmots die at ct equals 250 and 80 percent die at ct equals 1,000. Skin damaging action: slightly stronger than  $C_6H_5Cl_2$ .

679. Lethal dose (inhalation): One out of two marmots dies at ct equals 500, and two out of five die at 1,000. Irritating symptoms resemble those of  $CO_2$  and  $PCl_5$ . This agent has obvious irritating effect on the mucous membranes and weak lacrimatory action.

680. Lethal dose (inhalation): > 1,000 (marmot). ct equals over 10,000 (rabbit). Irritating symptoms are much inferior to those of  $H_2SO_4$ . This is inferior to  $\beta$  compounds,  $\beta$  same as for chlor compounds.

681. Lethal dose (inhalation): Three out of five marmots die at ct equals 700 and two out of five marmots die at ct equals 1,000. Hardly any irritating symptoms. Compared with methyl dichlor arsin, this agent is slightly inferior.

682.

683.

Dense vapor develops catarrh and sneezing.

684. Intolerability limit: 1 mg/m<sup>3</sup>. Toxicity: 50 percent of marmots die at ct equals 1,700. Sensation on human body in 1 minute: 0.02 mg/m<sup>3</sup>. Lethal dose (hypodermic injection): six out of six die at 10 mg/kg and two out of three at 5 mg/kg.

685. Lethal effect by inhalation is weak. Toxic character is slight. ct equals over 3,000 for rabbits and marmots. Irritating action is inferior.



# RESTRICTED

REF ID: A66100  
63

| No.  | Name                           | Structural formula | Physical state | Boiling point               | Melting point | Physiological effect |
|------|--------------------------------|--------------------|----------------|-----------------------------|---------------|----------------------|
| 887. | Diphenyl cyan arsin            |                    | Solid          | 356                         | 31.5          | Stimulant, irritant  |
| 888. | Diphenyl rhodan arsin          |                    | Liquid         | 185-190<br>(4mm)            |               | Irritant             |
| 889. | Diphenyl fluor arsin           |                    | Liquid         |                             |               | Irritant             |
| 890. | Diphenyl arsin acetat          |                    | Liquid         | 144-145<br>(0.25mm)         |               |                      |
| 891. | Diphenyl arsin tribromid       |                    | Solid          | 355<br>(partial resolution) | 54            |                      |
| 892. | Diphenyl arsin trichlorid      |                    | Crystal        |                             | 174           |                      |
| 893. | Diphenyl arsin di-chlor cyanid |                    | Solid          |                             | 130-133       | Stimulant            |
| 894. | Phenyl-o-tolyl chlor arsin     |                    | Liquid         | 166-8<br>(3.5mm)            |               | Stimulant            |
| 895. | Phenyl-m-tolyl chlor arsin     |                    | Liquid         | 171<br>(4mm)                |               | Stimulant            |
| 896. | Phenyl-p-tolyl chlor arsin     |                    | Liquid         | 158<br>(5mm)                |               | Stimulant            |
| 897. | Phenyl-o-tolyl brom arsin      |                    | Liquid         | 175<br>(3mm)                |               | Stimulant            |
| 898. | Phenyl-m-tolyl brom arsin      |                    | Liquid         | 174<br>(3mm)                |               | Stimulant            |
| 899. | Phenyl-p-tolyl brom arsin      |                    | Liquid         | 186-187<br>(4.5mm)          |               | Stimulant            |
| 900. | Phenyl-o-tolyl cyan arsin      |                    | Solid          | 174<br>(2.5mm)              | 27.5-28       | Stimulant            |
| 901. | Phenyl-m-tolyl cyan arsin      |                    | Liquid         | 180<br>(4mm)                |               | Stimulant            |
| 902. | Phenyl-p-tolyl cyan arsin      |                    | Crystal        |                             | 46.5-47.5     | Stimulant            |
| 903. | Phenyl-p-tolyl rhodan arsin    |                    | Liquid         | 193-4<br>(3.5mm)            |               | Stimulant            |
| 904. | o-acetyl diphenyl chlor arsin  |                    | Crystal        |                             | 70-71.5       | Stimulant            |

## No. Toxic character

887. Intolerability limit:  $0.25 \text{ mg/m}^3$ . Sensation on human body in one minute:  $0.02 \text{ mg/m}^3$ . Instantaneous unbearable amount:  $3.0 - 4.0 \text{ mg/m}^3$ . Toxicity (inhalation): 50 percent of marmots die at ct equals 1,500 and 1,300. Tasting action is strong compared with chlor arsin.
888. Toxicity (inhalation): Two out of ten marmots die at ct equals 2,000 and four out of ten die at 3,000. Compared with known military gases both irritating effect and lethal effect are somewhat inferior.
889. Lethal dose (inhalation): Two out of ten marmots die at ct equals 1,500 and four out of ten die at 3,000. Markedly inferior to known military gases.
890. Lethal dose (inhalation): None out of ten marmots dies at ct equals 1,000 and four out of ten die at 6,000. Compared with known military gases, both irritating and lethal effects are markedly inferior.
- 891.
- 892.
893. Lethal dose (hypodermic injection). Three out of three marmots die at  $10 \text{ ug/kg}$  and five out of seven die at  $5 \text{ mg/kg}$ .
894. Toxicity (inhalation): Three out of twenty die at ct equals 1,500. Compared with known agents, both irritating and lethal effects are somewhat inferior.
895. Toxicity (inhalation): None out of ten marmots dies at ct equals 1,000 and at 3,000. Compared with known agents, both irritating and lethal effects are markedly inferior.
896. Toxicity (inhalation): None out of 10 marmots dies at ct equals 1,500 and three out of ten die at 4,500. Has considerable sternutatory effect.
897. Toxicity (inhalation): One out of ten dies at ct equals 1,500. Both irritating and lethal effects are markedly inferior.
898. Toxicity (inhalation): None out of twenty dies at ct equals 1,500.
899. Toxicity (inhalation): Three out of ten (30 percent) marmots die at ct equals 1,500. Compared with known agents, both irritating and lethal effects are somewhat inferior.
900. Toxicity (inhalation): Six out of twenty die at ct equals 1,500. Compared to known agents both irritating and lethal effects are somewhat inferior.
901. Toxicity (inhalation): 35 percent die at ct equals 1,500. Compared with known agents, both irritating and lethal effects are somewhat inferior.
902. Toxicity (inhalation): 27 percent of marmots die at ct equals 1,000, 35 percent die at ct equals 1,500, and seven out of ten (70 percent) die at ct equals 5,000. Considered to possess 2-3 times the toxicity of para chlor arsin and para brom arsin.
903. Toxicity (inhalation): One out of ten marmots dies at ct equals 1,500 and three out of ten (30 percent) die at ct equals 5,000.
904. Lethal dose (inhalation): No marmots die at ct equals 1,000, 10 percent die at 1,500, and 80 percent die at 3,000.



Classified as Secret  
EXCLUDED FROM AUTOMATIC  
DOWNGRADING AND  
DECLASSIFICATION

RESTRICTED

SECRET

21

|      | Structural<br>Formula                   | Physical<br>state | Boiling<br>point | Melting<br>point |                  |
|------|---|-------------------|------------------|------------------|------------------|
| 905. | Diphenyl methan-o-                      | Solid             |                  |                  |                  |
| 906. | Diphenyl methan-m-<br>arsinearsine      | Solid             |                  | 100              |                  |
| 907. | Diphenyl methan-p-                      |                   |                  | 105              |                  |
| 908. | Diphenyl methan-<br>dichlor arsin       | Crystal           | 180<br>(1mm)     | 10-15            |                  |
| 909. | Diphenyl methan-m-<br>dichlor arsin     | Liquid            | 173.5<br>(1mm)   |                  |                  |
| 910. | Diphenyl methan-p-<br>dichlor arsin     | Crystal           | 188<br>(1mm)     | 21               |                  |
| 911. | Diphenyl methan-m-<br>dibrom arsin      | Liquid            | 202              |                  |                  |
| 912. | Diphenyl methan-p-<br>dibrom arsin      | Solid             | 212              | 31               |                  |
| 913. | Diphenyl methan-o-<br>chlor arsin       | Crystal           |                  | 114-115          | Stomach irritant |
| 914. | Arsanthren chlorid                      | Solid             |                  | 120-121          | Irritant         |
| 915. | Phenoxy chlor arsin                     | Solid             |                  | 124              | Irritant         |
| 916. | Phenoxy brom arsin                      | Solid             |                  | 128              | Irritant         |
| 917. | Phenoxy cyan arsin                      | Crystal           |                  | 132              | Irritant         |
| 918. | Diphenyl amin chlor<br>arsin            | Solid             | 410              | 133              | Stomach irritant |
| 919. | Diphenyl amin brom<br>arsin             | Solid             |                  | 219-219          | Stomach irritant |
| 920. | Diphenyl amin cyan<br>arsin             | Solid             |                  | 130-133          | Irritant         |
| 921. | Diphenyl amin iod<br>arsin              | Solid             |                  | 119              |                  |
| 922. | 3, 3'-dinitro di-<br>phenyl chlor arsin | Crystal           |                  | 112              | Irritant         |
| 923. | 3, 3'-dinitro di-<br>phenyl brom arsin  | Solid             |                  | 114-<br>115      | Irritant         |

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REGISTRY NUMBER

7. 1940

## No. Toxic character

- 905.
- 906.
- 907.
- 908.
909. Toxicity (inhalation): Two out of five marmosets and one out of two rabbits die at ct equals 1,000.
910. Toxicity (inhalation): One out of five marmosets and none out of two rabbits die at ct equals 1,000.
911. Toxicity (inhalation): Two out of five marmosets and none out of two rabbits die at ct equals 2,000. Irritating action: in compounds > p.
912. Toxicity (inhalation): ct equals about 2,000 (marmoset).
913. Toxicity (inhalation): None out of five marmosets and none out of two rabbits die at ct equals 1,000.
914. Toxicity (inhalation): Two out of five marmosets die at ct equals 1,500 and none out of five rabbits dies at ct equals 1,700. Experience shows that toxicity is weaker than that of No. 1.
915. Toxicity (inhalation): Two out of five marmosets die at ct equals 3,000 and 12 out of 25 (48 percent) die at 3,000. Somewhat inferior to No. 1. Toxicity is believed to be considerably stronger than that of cyan acids.
916. Toxicity (inhalation): One out of two marmosets dies at ct equals 2,000 and 52 percent die at 3,000.
917. Toxicity (inhalation): None out of two marmosets dies at ct equals 2,000 and three out of five die at 5,000. Somewhat inferior to No. 1.
918. Inedibility limit: 0.4 mg/m<sup>3</sup>. Sensation on human body in 1 minute: 0.04 mg/m<sup>3</sup>. Lung and intestinal damage: at equals 700 (half); at equals 2,500-3,000 (total). Lethal dose (hypodermic injection): 5 out of 7 die at 5 mg/kg. Sternutatory effect: Cl>Br>CN. Toxic effect (hypodermic injection): CN>Cl>Br.
919. Lethal dose (inhalation): Two out of five die at 5 mg/kg.
920. Lethal dose (hypodermic injection): 6 out of 7 die at 5 mg/kg.
- 921.
922. Lethal dose (inhalation): Four out of five marmosets die at ct equals 500 and 65 percent die at 1,000.
923. Lethal dose (inhalation): 40 percent die at ct equals 500 and 60 percent die at 1,000. It is not thought that this agent surpasses known military gases with respect to lacrimatory action and mucous membrane irritating effect. About the same as chlorides, and stronger than cyan compounds.

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INSTRUMENT NUMBER

10-11-1944

## Basic data

Lethal dose (inhalation): 20 percent of marmosets die at or equals 2,000 and 90 percent die at 3,000. Irritating action and lethal effect by inhalation are weaker than for No. 1.

Lethal dose (inhalation): One set of five marmosets dies at or equals 2,000 and 2 sets of 10 die at or equals 3,000. Irritating action and lethal effect by inhalation are somewhat weaker than for No. 1.





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(Classification Stamp)

DD FORM 100-1

REGISTRY NUMBER

DATE

## No. Toxic character

926. Toxicity (inhalation): None out of ten marmosets dies at ct equals 3,000 and one out of ten dies at ct equals 6,000. Markedly inferior to No. 1.
927. Toxicity (inhalation): None out of ten marmosets dies at ct equals 3,000 and one out of ten dies at ct equals 6,000.
928. Toxicity (inhalation): Four out of ten marmosets die at ct equals 3,000 and six out of ten die at ct equals 6,000.
929. Toxicity (inhalation): One out of eight dies at ct equals 3,000 and two out of ten dies at ct equals 3,000.
930. Toxicity (inhalation): One out of ten marmosets dies at ct equals 3,000. Irritating action and lethal effect are much inferior to those of No. 1.
931. Toxicity (inhalation): None out of ten marmosets dies at ct equals 3,000 and three out of ten die at ct equals 6,000. Irritating and lethal effects are somewhat weaker than those of No. 1.
932. Toxic character is inferior to that of diphenyl arsin.
933. Lethal dose (skin application): 5 out of 6 die at 5 mg/kg. Lethal dose (hypodermic injection): 7 out of 7 die at 5 mg/kg.
934. Considerably weaker than No. 2.
- 935.
936. Toxicity (inhalation): 4 out of 20 marmosets die at ct equals 3,000.
937. Toxicity (inhalation): None out of ten marmosets dies at ct equals 3,000 and none out of ten rabbits die at ct equals 3,000. Irritating, stomatocary, and lethal effects are considerably inferior to those of known military agents.
938. Lethal dose (skin application): Two out of ten rabbits die at 5 mg/kg and six out of ten die at 5 mg/kg. (Compare with No. 3). Venous effect shows close resemblance to that of No. 2.
939. Lethal dose (skin application): 6 out of 10 rabbits die at 3 mg/kg and 4 out of 10 die at 5 mg/kg. Slightly superior to No. 3. Venous effect shows close resemblance to that of No. 3, and damaging effect is only slightly inferior.
- 940.
941. Lethal dose (inhalation): One out of 10 marmosets dies at ct equals 300, 2 out of 10 die at 1,000, and 5 out of 10 die at 1,500. Irritating action: Violent at the time of inhalation and compares with the irritating action of No. 1. However, the time of recovery is much shorter. Lethal dose (hypodermic injection): 7 out of 10 die at 2 mg/kg, 9 out of 10 die at 3 mg/kg, and 10 out of 10 die at 5 mg/kg.
- 942.
- 943.
944. Lethal dose (inhalation): 5 out of 10 die at ct equals 800. Irritating action: closely resembles No. 1; mucous membrane irritating action and stomatocary effect are apparent. Lethal dose (hypodermic injection): 2 out of 5 die at 2 mg/kg. Has toxic character similar to that of known military agents.

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(Classification Stamp)

SECRET DISSEMINATION

SECURITY NUMBER

CLASS NO. 123

|      |   | Structural<br>Formula | Physical<br>State   | Boiling<br>Point | Melting<br>Point               | Toxicology                   |
|------|---|-----------------------|---------------------|------------------|--------------------------------|------------------------------|
| 946. | Tri (pyridin-2-amino)<br>arsin chlor hydrat<br>kupper chlorid     |                       | Solid               |                  | 155-156                        | Irritant,<br>stermatocidal   |
| 947. | 2-chlor pyridyl-5-<br>arsin dichlorid<br>chlor hydrat             |                       | Solid               |                  | 95-96                          |                              |
| 948. | 2-amino pyridin-5-<br>arsin dichlorid chlor<br>hydrat             |                       | Crystal             |                  | 192-193                        |                              |
| 949. | Pyridin-3-arsin di- )<br>chlorid<br>Pyridin-3-arsin )<br>misch    | } mixed               | Solid               |                  | 180-181                        | Irritant,<br>stermatocidal   |
| 950. | Di-3-pyridyl chlor<br>arsin dichlor hydrat                        |                       | Solid               |                  | 268-269                        | Irritant                     |
| 951. | 2-furyl dichlor arsin   |                       | Liquid              | 83-100<br>(7mm)  |                                | Irritant,<br>vesicant        |
| 952. | 2,4'-difuryl chlor<br>arsin                                       |                       | Liquid              | 120-143<br>(6mm) |                                | Irritant,<br>vesicant        |
| 953. | 2,4'-difuryl cyan arsin   |                       | Liquid              | 145-147<br>(3mm) | Under<br>-30<br>(not<br>clear) | Irritant,<br>vesicant        |
| 954. | Kolozol (pikrin chlorid)<br>trichlor nitromethan                  |                       | Liquid              | 112              | -69.2                          | Lacrimator,<br>lung injurant |
| 955. | Tribrom nitromethan   |                       | Liquid<br>(crystal) | 127<br>(118mm)   | 10.25                          | Lacrimator<br>lung injurant  |
|      | Nec kolozol<br>(trichlor nitromethan )<br>(dichlor dinitromethan) | } mixed               | Liquid              |                  |                                | Lacrimator<br>lung injurant  |
| 957. | Dichlor dinitromethan   |                       | Liquid              |                  |                                | Lacrimator                   |
| 958. | Dichlor nitro aceto-<br>nitril                                    |                       | Liquid              | 39<br>(31mm)     |                                | Irritant                     |
| 959. | Dibrom nitro aceto-<br>nitril                                     |                       | Liquid              | 57-58<br>(12mm)  | About<br>30                    | Irritant                     |
| 960. | Nitro athylen   |                       | Liquid              | 97.5             |                                | Lacrimator                   |
| 961. | Tribrom nitro athylen   |                       |                     |                  |                                |                              |
| 962. | 5-nitro-2-furyl<br>chlorid  |                       |                     |                  |                                |                              |
|      | 2-nitro-4-chlor anisol  |                       |                     |                  | 97-98                          |                              |

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DISSEMINATION FORM FOR ID TRANSLATIONS



Lethal dose (inhalation): One out of five marmots dies at ct equals 3,000. Irritating effect at the time of inhalation is weaker than that of No. 1. Lethal dose (skin application): 2 out of 5 die at 30 mg/kg.

947. Lethal dose (hypodermic injection): Marmots did not die when tested at 5, 5, 10, and 15 mg/kg.

948.

Lethal dose (inhalation): 4 out of 10 die at ct equals 500 and 8 out of 10 die at ct equals 1,000. Somewhat stronger than No. 1.

950. Lethal dose (inhalation): 5 out of 10 marmots die at ct equals 800 and 9 out of 10 die at ct equals 2,000. Irritating action: Irritating action at the time of inhalation is strong and irritation of the mucous membrane of the nose is apparent, about the same as No. 1. Lethal dose (hypodermic injection): 3 out of 5 rabbits die at 5 mg/kg.

951. Lethal dose (hypodermic injection): 1 out of 5 dies at 5 mg/kg, 3 out of 5 die at 5 mg/kg, and 4 out of 5 die at 10 mg/kg.

952. Vesicant action on skin: Resembles No. 2 but effect is inferior. Moreover 2-chloro-4-fluorobenzene is slightly stronger than 2,4-difluorobenzene. Lethal dose (hypodermic injection): None out of 5 rabbits die at 5 mg/kg, 2 out of 5 die at 10 mg/kg, and 5 out of 5 die at 15 mg/kg.

953. Lethal dose (hypodermic injection): 2 out of 5 die at 5 mg/kg and 3 out of 5 die at 10-15 mg/kg. Vesicant action on skin: Inferior to No. 2. About the same as similar chlorides. Somewhat weaker than 2-chloro-4-fluorobenzene.

954. Toxicity (inhalation): None out of 5 marmots dies at ct equals 1,100 and at 2,000. One out of 5 dies at ct equals 4,400. Lethal dose (inhalation): 50 per cent of marmots die at ct equals 9,500 and 50 percent of rabbits die at ct equals 25,000. Has lacrimatory, suffocative, and vesicating actions. Intolerability limit: 50 mg/m<sup>3</sup>.

955. Toxicity (inhalation): None out of 5 marmots dies at ct equals 1,100, 2,200, and 4,400. Toxic character is similar to that of chlor pikrin.

956. Toxicity (inhalation): 1 out of 5 marmots die at ct equals 1,100 and 2 out of 5 die at ct equals 2,200 and at 4,400. This agent appears to be somewhat superior to chlor pikrin with regard to high density toxication. Irritating and lacrimatory actions are similar to those of chlor and brom pikrin.

957. This agent is 1/8 to 1/10 as toxic as chlor pikrin.

958. Toxicity (inhalation): There is no irritation at ct equals 9,000 (rabbit and marmot).

959. Toxicity (inhalation): Irritation is strong at ct equals 5,000 (rabbit and marmot).

960. Irritating action is superior to that of "brom acetone" and "jed acetone".

961.

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|   |                              |                        |
|---|------------------------------|------------------------|
| (Name of Chemical)<br>1,1,1-Trichloroethane | REGISTRY NUMBER:<br>100-00-0 | CAS NUMBER:<br>75-71-4 |
|---|------------------------------|------------------------|

13. Small animal tests

13- Toxicity (inhalation): 2 out of 5 marmosets die at ct equals 4,400 and none out of 2 rabbits die at 15,000. Irritating and inhalation actions weak. Skin damaging action is completely absent.

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|      |                                   | Structural<br>Formula | Physical<br>Class | Boiling<br>°C | Melting<br>°C | Toxicological<br>Notes             |
|------|-----------------------------------|-----------------------|-------------------|---------------|---------------|------------------------------------|
| 240. | 4-nitro-3-chlor<br>anisole        |                       | Solid             |               | 94            |                                    |
| 241. | 2-nitro-4, 6-<br>dichloro anisole |                       | Solid             |               | 44            |                                    |
| 242. | 4-nitro-2, 6-<br>dichloro anisole |                       | Solid             |               | 97            |                                    |
| 243. | o-nitro benzo nitril              |                       | Solid             |               | 109           | Systemic<br>poison                 |
| 244. | m-nitro benzo nitril              |                       | Solid             |               | 117-118       | Systemic<br>poison                 |
| 247. | p-nitro benzo nitril              |                       | Solid             |               | 146-147       | Systemic<br>poison                 |
| 255. | o-nitro benzyl iso<br>cyanat      |                       | Solid             |               | 52            | Lacrimator                         |
| 256. | o-nitro benzyl chlorid            |                       | Solid             |               | 46            |                                    |
| 210. | m-nitro benzyl chlorid            |                       | Solid             |               | 46-47         |                                    |
| 211. | p-nitro benzyl chlorid            |                       | Solid             |               | 71            |                                    |
| 212. | o-nitro benzyl bromid             |                       | Solid             |               | 46-47         | Lacrimator                         |
| 213. | m-nitro benzyl bromid             |                       | Solid             |               |               |                                    |
| 214. | p-nitro benzyl bromid             |                       | Solid             |               | 97-100        | Lacrimator                         |
| 215. | p-nitro benzyl bromid             |                       | Solid             | 173-174       | 92-92.5       |                                    |
| 960. | o-nitro chlor aceto-<br>phenon    |                       | Crystal           |               | 66            | Stomach<br>irritant,<br>lacrimator |
| 961. | o-nitro brom aceto-<br>phenon     |                       | Crystal           |               | 54.5          | Stomach<br>irritant                |
| 962. | o-nitro iod aceto-<br>phenon      |                       | Crystal           |               | 49.5          |                                    |
| 963. | m-nitro chlor aceto-<br>phenon    |                       | Crystal           |               | 101           | Stomach<br>irritant                |
| 964. | m-nitro brom aceto-<br>phenon     |                       | Crystal           |               | 95            | Stomach<br>irritant                |
| 965. | m-nitro iod aceto-<br>phenon      |                       | Crystal           |               | 92.5          | Stomach<br>irritant                |
| 966. | p-nitro chlor aceto-<br>phenon    |                       | Crystal           |               | 90            | Irritant                           |
| 967. | p-nitro brom aceto-<br>phenon     |                       | Crystal           |               | 95.5          | Irritant                           |

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- | No.  | Toxic character  |
|------|--|
| 340. | Toxicity (inhalation): None out of 5 marmots die at ct equals 4,000 and none out of two rabbits dies at 15,000. Inhalation, lacrimatory, and irritating actions are weak.  |
| 341. | Toxicity (inhalation): 3 out of 3 marmots die at ct equals 4,000 and none out of 3 rabbits dies at 15,000. Inhalation, irritating, and lacrimatory actions are weak.   |
| 342. | Toxicity (inhalation): 1 out of 3 marmots die at ct equals 4,000 and none out of 3 rabbits dies at 15,000. Inhalation, irritating, and lacrimatory actions are weak.   |
| 343. | Lethal dose (inhalation): ct equals over 5,000. Irritating action not apparent.  |
| 346. | Same as above.   |
| 347. | Same as above.   |
| 348. | Lethal dose (inhalation): ct equals over 5,000. Irritating and lacrimatory actions markedly superior to those of o-nitro benzyl chlorid, but inferior to benzyl chlorid.   |
| 309. | Lethal dose (inhalation): Rabbits and marmots do not die at ct equals over 5,000. Lethal effect by inhalation is very weak.  |
| 310. | Like o.n.p., the toxic character of this agent is all compared with known military gases.  |
| 311. |  |
| 312. | Practically the same as known lacrimator (benzyl bromid)   |
| 313. |  |
| 314. |  |
| 315. |  |
| 316. |  |
| 317. |  |
| 318. | Lethal dose (inhalation): ct equals over 5,000 (rabbit and marmot). Sternutatory properties, though apparent, are weaker than those of diphenyl cyan arsin. Lacrimatory properties, though somewhat prominent, are inferior to those of chlor picrin. Irritating action: o and p > m. Cl > Br. |
| 319. | Lethal dose (inhalation): ct equals over 5,000 (rabbit and marmot). Has sternutatory properties but is weaker than diphenyl cyan arsin.  |
| 320. | Toxicity (inhalation): Rabbits and marmots do not die at ct equals 5,000. Lacrimatory action is very weak. Irritating action on the mucous membrane of the nose is also weak.  |
| 363. | Lethal dose (inhalation): ct equals over 5,000 (rabbits and marmot). Sternutatory properties, though apparent, are weaker than those of diphenyl cyan arsin.   |
| 364. | Lethal dose (inhalation): ct equals over 5,000 (rabbit and marmot). Irritating action: o and p > m. Cl > Br. Sternutatory action, though present, is weaker than that of diphenyl cyan arsin.  |





| No.  | Name                               | formula | state   | point         | point               | effect   |
|------|------------------------------------|---------|---------|---------------|---------------------|----------|
| 968. | p-nitro iod acetophenon            |         | Crystal |               | 94                  | Irritant |
| 969. | o-nitro dichlor acetophenon        |         | Crystal |               | 81                  | Irritant |
| 970. | o-nitro chlor brom acetophenon     |         | Crystal |               | 95-96               | Irritant |
| 971. | o-nitro dibrom acetophenon         |         | Crystal |               | 85-86               | Irritant |
| 972. | m-nitro dichlor acetophenon        |         | Crystal |               | 57-58               |          |
| 973. | m-nitro chlor brom acetophenon     |         | Crystal |               | 43-44               | Irritant |
| 974. | m-nitro dibrom acetophenon         |         | Crystal |               | 59                  | Irritant |
| 975. | p-nitro dichlor acetophenon        |         | Crystal |               | 35                  | Irritant |
| 976. | p-nitro chlor brom acetophenon     |         | Crystal |               | 85                  | Irritant |
| 977. | p-nitro dibrom acetophenon         |         | Crystal |               | 67                  | Irritant |
| 844. | o-nitro phenyl arsine              |         | Solid   |               | 235-240             |          |
| 845. | m-nitro phenyl arsine              |         | Solid   |               | About 20            |          |
| 846. | p-nitro phenyl arsine              |         | Solid   |               | Resolves at over 20 |          |
| 847. | o-nitro phenyl dichlor arsin       |         | Solid   |               | 49-50               | Vesicant |
| 848. | m-nitro phenyl dichlor arsin       |         | Solid   |               | 53-54               | Vesicant |
|      | p-nitro phenyl dichlor arsin       |         | Liquid  | 207 (17mm)    |                     | Vesicant |
|      | m-nitro phenyl dichlor arsin       |         | Crystal |               | 64-64.5             | Vesicant |
| 849. | m-nitro phenyl methoxy chlor arsin |         | Liquid  | 155-156 (4mm) |                     |          |



Toxic character

- 369 Toxicity (inhalation): Rabbits and marmots do not die at ct equals 8,000. Inhalation and irritating effects and lacrimatory action are very weak. Irritation of the mucous membranes of the nose is fairly apparent. The toxic character of this agent is much weaker than that of known military gases.
- 370 Toxicity (inhalation): Rabbits and marmots do not die at ct equals up to 10,000. Inhalation and irritating effects and lacrimatory action are very weak. Irritation of the mucous membranes of the nose is fairly apparent. The toxic character is much weaker than that of known military gases.
- 371 Toxicity (inhalation): Rabbits and marmots do not die at ct equals 5,000 and at 10,000. Inhalation and irritating effects and lacrimatory action are very weak. Irritation of the mucous membranes of the nose is apparent. Toxic character is much weaker than that of known military gases.
- 372 Toxicity (inhalation): Rabbits and marmots do not die at ct equals 5,000. Lacrimatory effect is weak, and irritating effect on the mucous membranes of the nose is slight.
- 373 Toxicity (inhalation): One out of two marmots dies at ct equals 5,000. Inhalation and irritating symptoms are somewhat inferior to those of known military gases.
- 374 Toxicity (inhalation): One out of five marmots dies at ct equals 10,000. Inhalation and irritating symptoms and lacrimatory effect are very weak. Irritating effect on the mucous membranes of the nose is apparent. The toxic character of the agent is very weak when compared with known military gases.
- 375 Toxicity (inhalation): Rabbits and marmots do not die at ct equals 5,000 and at 10,000. Irritation is temporary. Compared with known military irritants, this agent is lacking in persistency.
- 376 Toxicity (inhalation): 3 out of 8 marmots die at ct equals 10,000. Irritates the mucous membranes of the nose, and causes sneezing at low doses.
- 377 Toxicity (inhalation): Rabbits and marmots do not die at ct equals 8,000 and at 5,000. Irritating effect on the mucous membranes of the nose, although fairly apparent, is weak when compared with known gases.
- 378
- 379
- 380 Lethal dose (inhalation): 10 percent of marmots die at ct equals 330. Vesicant effect on skin: ++
- 381 Lethal dose (inhalation): 10 percent of marmots die at ct equals 330. 36 percent die at 250, and 75 percent die at 5,000.
- 382 Lethal dose (inhalation): 35 percent of marmots die at ct equals 330 and 33 percent die at ct equals 5,000. Vesicant action: moderate.
- 383 Lethal dose (inhalation): 5 out of 10 marmots die at ct equals 330 and 7 out of 10 die at 750.

| No.  | Name   | Structural formula | Physical state | Boiling point   | Melting point | Physiological effect   |
|------|--|--------------------|----------------|-----------------|---------------|------------------------|
| 874. | m-nitro phenyl<br>athoxy chlor arsin                     |                    | Liquid         | 159-161         |               |                        |
| 932. | 3,3'-dinitro di-<br>phenyl chlor arsin                   |                    | Crystal        |                 | 112           | Irritant               |
| 923. | 3,3'-dinitro di-<br>phenyl brom arsin                    |                    | Solid          |                 | 91.5-<br>92.5 | Irritant               |
| 924. | 3,3'-dinitro diphenyl<br>cyan arsin                      |                    | Solid          |                 | 145           | Irritant               |
| 938. | Bis-(3,3'-dinitro<br>diphenyl arsin) sul-<br>fid         |                    | Solid          |                 | 157-158       | Irritant               |
| 462. | Nitrosyl chlorid   |                    | Gas            | -8              | -60           | Irritant               |
| 463. | Nitrosyl bromid  |                    | Gas            | -2              | -55           | Irritant               |
| 978. | Trichlor nitroso<br>methan                               |                    | Liquid         | 57-8            |               | Irritant               |
| 979. | Aethyl nitrit  |                    | Liquid         | 17              |               |                        |
| 980. | Monochlor nitroso<br>methan                              |                    | Solid          |                 | 65            |                        |
| 284. | Nitroso methyl<br>urethan                                |                    | Liquid         | 59-60<br>(15mm) |               |                        |
| 285. | Nitroso aethyl<br>urethan                                |                    | Liquid         | 70<br>(27mm)    |               | Vesicant               |
| 981. | Nitroso phenyl<br>hydroxylamin                           |                    | Crystal        |                 | 58-59         |                        |
| 982. | Nitroso phenyl<br>hydroxylamin NH <sub>4</sub> -<br>salz |                    | Crystal        |                 | 163-164       |                        |
|      | Nitroso carbonil<br>saure chlorid                        |                    | Crystal        |                 | 191-192       |                        |
|      | Cyanur trichlorid  |                    | Solid          | 170             | 144-145       | Irritant,<br>lacrimate |
|      | 2,4,6-trichlor<br>pyrimidin                              |                    | Liquid         | 213             | 21            | Vesicant               |
|      | methyli bromid   |                    | Gas            | 4.5             |               | Anesthetic             |
|      | Monochlor kohlen<br>saure dimethyl                       |                    | Liquid         | 55-56<br>(50mm) |               | Strong Irritant        |
|      | Dichlor kohlen<br>saure dimethyl                         |                    | Liquid         | 70-75<br>(10mm) |               | Strong Irritant        |



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## 70 Toxic character

984. Lethal dose (inhalation): 4 out of 10 marmots die at ct equals 500 and 20 percent die at 1,000.

985. Lethal dose (inhalation): 40 percent of marmots die at ct equals 300 and 60 percent die at 1,000.

986. Lethal dose (inhalation): 20 percent of marmots die at ct equals 1,000 and 40 percent die at 5,000.

987. Toxicity (inhalation): None out of ten marmots dies at 3,000.

988. Toxicity (inhalation): One out of 10 marmots dies at ct equals 4,000, at 6,000, and at 10,000. Toxic character is much weaker than that of known military gases. Smoker than iron poison. Irritating action is not great.

989. Toxicity (inhalation): One out of 10 marmots dies at ct equals 2,250 and at 5,500. Markedly inferior to known military gases.

990.

991.

992.

993.

994. Lethal dose (hypodermic injection): None out of five dies at 10 mg/kg.

Lethal dose (skin application): None out of five dies at 20 mg/kg.

Toxicity (inhalation): Hardly any changes detected in rabbits and marmots at ct equals 5,000. Skin damage: Markedly inferior to sperite.

995. Toxicity (inhalation): One out of five marmots dies at ct equals 7,000.

Lethal dose (hypodermic injection): One out of five dies at 10 mg/kg.

Four out of five die at 50 mg/kg. Has slight vesicant effect. Compared with known gases.

996. Toxicity (inhalation): Two out of five marmots die at ct equals 2,000.

Lethal dose (hypodermic injection): one out of five dies at 30 mg/kg, and two out of five die at 50 mg/kg. Much weaker than known military gases.

997.

998. Lethal dose (inhalation): One out of five marmots die at ct equals 10,000. Four out of ten marmots die at ct equals 10,000. Irritating effect on the mucous membranes of the nose and larynx. Anterior effect are fairly strong.

999. Effect of hypodermic injection: cannot kill rabbits immediately at 30 mg/kg.

Comparison of vesicant effect on skin: 20 percent solution of No. 1 equals 25 percent solution of No. 1. Unlike No. 1, damage is very light.

(1)0. Anesthetic effect is inferior to that of chloroform, but death rate is higher.

(2) Inhalation effect is inferior to that of phosgen. None out of four rabbits dies at ct equals 1,500. Markedly inferior to chlor acetone in laryngeal action.

(3) Inhalation effect: None out of four rabbits dies at ct equals 10,000.

Residues described by chemical analysis.

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EVIDENCE LABEL

CONTAINER NUMBER

| No.   | Name                                     | Physical<br>Formula | Physical<br>state | Boiling<br>point             | Melting<br>point | Effect                             |
|-------|--|---------------------|-------------------|------------------------------|------------------|------------------------------------|
| (5)   | Trichlor kohlen saure<br>dimethyl        |                     | Liquid            | 161-163<br>59.5-60<br>(16mm) |                  | Lung injurious                     |
| (5)   | Trichlor kohlen saure<br>dimethyl        |                     | Crystal           |                              | 25-27            | Lung injurious                     |
| (6)   | Monochlor cyan essig-<br>saure methyl    |                     | Liquid            | 70-75<br>(10mm)              |                  | Irritant                           |
| (7)   | Monochlor cyan essig-<br>saure ethyl     |                     | Liquid            | 71-77                        |                  | Irritant                           |
| (8)   | Dichlor cyan essig-<br>saure methyl      |                     | Liquid            | 55-60<br>(10mm)              |                  | Irritant                           |
| (9)   | Dichlor cyan essig-<br>saure ethyl       |                     | Liquid            | 55-55<br>(10mm)              |                  | Irritant                           |
| (10)0 | Dichlor dimethyl<br>ether / phosgen      |                     | Liquid            |                              |                  | Lung injurious                     |
| (11)0 | Dichlor dimethyl<br>ether / diphosgen    |                     | Liquid            |                              |                  | Lung injurious                     |
| (12)0 | Dichlor dimethyl<br>ether / phosphor     |                     | Liquid            |                              |                  | Lung injurious,<br>systemic poison |
| (13)0 | 4-chlor-2-methyl<br>anisol               |                     | Liquid            | 208-210                      | 0-3              | Irritant                           |
| (14)0 | 5-chlor-2-methyl<br>anisol               |                     | Liquid            |                              |                  | Irritant                           |
| (15)0 | 4,6-chlor-2-methyl<br>anisol             |                     | Liquid            | 228-230                      | 10-13            | Irritant                           |
| (16)0 | 2-chlor-3-methyl<br>anisol               |                     | Liquid            | 110-112<br>(90mm)            |                  | Irritant                           |
| (17)  | Benzoesaure monochlor<br>methyl ester    |                     | Liquid            | 100-125<br>(20mm)            |                  |                                    |
| (18)  | 2-chlor iso capron<br>saure methyl ester |                     | Liquid            | 161-165                      |                  | Vesicant                           |
| (19)  | Acetone                                  |                     | Crystal           | 61.3                         | 52               | Systemic<br>poison                 |
| (20)  | Aceto nitril                             |                     | Liquid            | 82                           | -45              | Systemic<br>poison                 |
|       | Acetonitril /<br>dimethyl                |                     | Liquid            |                              | -12              | poison                             |
|       | Propionitril                             |                     | Liquid            | 98                           | -106             | Systemic<br>poison                 |

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INFORMATION ACQUISITION FOR ID TRANSLATIONS

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Toxic character

- (4) Both inhalation effect and irritating actions are weak. One out of two rabbits dies at ct equals 10,000 and at 15,000. None out of five marmots dies at ct equals 4,400.
- (5) Inferior to phosgen in inhalation effect. Two out of five marmots die at ct equals 2,200, at 3,000, and at 4,400. Inferior to chlor aceto phenon in irritating action.
- (6) Much inferior to phosgen in inhalation effect. None out of four rabbits dies at ct equals 10,000 and at 15,000.
- (7) Much inferior to phosgen in inhalation effect. None out of four rabbits dies at ct equals 10,000 and at 15,000. Irritating action is somewhat inferior to chlor aceto phenon.
- (8) Compared with military agents, both inhalation and irritating effects are markedly inferior. None out of four rabbits dies at ct equals 15,000.
- (9) Compared with military agents, both inhalation and irritating effects are markedly inferior. However, this agent is somewhat superior to methyl compounds. None out of four rabbits dies at ct equals 15,000.
- (10) Lung injuring effect: Very strong. Somewhat inferior to phosgen but superior with dichlor dimethyl ether. On equals 1,000-12,000 (marmots) about 12,000 Ca (sic); 7,000 (marmot).
- (11) Lethal effect by inhalation: When the ratio of x to y is (1:2) or (1:1), the effect is somewhat inferior. When the amount of diphosgen is greater, there is early death. When the amount of dichlor dimethyl ether is greater, serious symptoms develop later.
- (12) Toxic character: This character is strong, and lung injury is very serious. The effect is inferior to phosgen. The greater the amount of HCN, the greater the effect. When the amount of HCN is over 600mg/m<sup>3</sup> (5 minutes inhalation), one-half to all die.
- (13) Lethal effect by inhalation is very weak. Irritating and lacrimatory actions are very weak. Somewhat inferior to 6-chlor anisol.
- (14)
- (15)
- (16)
- (17)
- (18) Toxic character not detected.
- (19) Toxic character: Weak compared with HCN. One out of three marmots dies at ct equals 1,000 and three out of three die at 2,000. Lung injuring effect is weak compared with phosgen.
- (20) Toxic character: Effect is very weak. Rabbits do not die at 3,000mg/m<sup>3</sup> for 5 minutes (ct equals 15,000).

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44/6

Doc. No. 44/6/1/1

- (21) Toxic character: Although toxic, it is somewhat inferior to HCN only. The greater the amount of HCN, the greater the effect. When the amount of HCN is over 500 mg/kg (5 minutes inhalation), one-half to all die.
- (22) Toxic character: Very weak. Difficult to determine the superiority and inferiority between this and acetonitril. No great changes detected after breathing for 5 minutes in 300 mg/m<sup>3</sup>:

SECRET



| Name   | Structural<br>Formula | Physical<br>state | Boiling<br>point  | Melting<br>point | Biological<br>activity        |
|--|-----------------------|-------------------|-------------------|------------------|-------------------------------|
| Propionitril / phosgen                           |                       | Solid             |                   | 93               | lung irritant,<br>lacrimation |
| Propionitril /<br>diphosgen                      |                       | Solid             |                   |                  | lung irritant,<br>lacrimation |
| N-chlor chlor acet acid                          |                       | Solid             |                   | 115-116          | lung irritant,<br>lacrimation |
| Chlor acetyl hornstaff                           |                       | Crystal           |                   | 130-131          | Irritant,<br>lacrimation      |
| Dichlor acetyl horn-<br>staff                    |                       | Solid             |                   | 150              | Irritant,<br>lacrimation      |
| N-trichlor monochlor<br>acetyl hornstaff         |                       | Crystal           |                   | 160-162          | lung irritant,<br>lacrimation |
| Acetyl cholin chlorid                            |                       | Solid             |                   | 250              |                               |
| Form acid  |                       | Liquid            | 120-130<br>(40mm) |                  | lung irritant,<br>lacrimation |
| N-chlor acet amid                                |                       | Crystal           |                   | 103-105          | Irritant                      |
| Tribrom triethyl amin<br>hydrochlorid            |                       | Crystal           |                   | 120-122          | Irritant                      |
| Heptansäure-(4-oxy-3-<br>methoxy-benzylamid)     |                       | Crystal           |                   | 61               | Irritant                      |
| Octansäure-(4-oxy-3-<br>methoxy-benzyl amid)     |                       | Crystal           |                   | 44               | Irritant                      |
| Nonansäure-(4-oxy-3-<br>methoxy-benzyl amid)     |                       | Crystal           |                   | 51               | Irritant                      |
| Decansäure-(4-oxy-3-<br>methoxy-benzyl amid)     |                       | Crystal           |                   | 30               | Irritant                      |
| Undecylensäure-(4-oxy-<br>3-methoxy benzyl amid) |                       | Crystal           |                   | 41               | Irritant                      |
| Dodecylensäure-(4-oxy-<br>3-methoxy benzyl amid) |                       | Crystal           |                   | 51               | Irritant                      |
| 66) L.L.L. -trichlor<br>acet acid                |                       | Solid             |                   | 50               | Irritant                      |
| 67) L-brom-4-methoxy<br>propio phenon            |                       | Crystal           |                   | 66.5             | Irritant                      |

As. Toxic character

- (100) Lacrimatory and lung injuring effect: Both weak. Rabbits do not die at ct equals 15,000.
- (200) Lethal effect by inhalation: Weak. Rabbits do not die at ct equals 15,000.
- (250) Irritating and lacrimatory actions are very weak.
- (300) Irritating and lacrimatory effects: Weak. Appears to be somewhat inferior to dichloroacetyl urea.
- (350) Irritating and lacrimatory effects: Weak. Appears to be somewhat inferior to chloroacetyl urea.
- (400) Irritating and lacrimatory effects are weak. Difficult to detect any marked superiority or inferiority when compared with chloroacetyl urea.
- (450)
- (500) Irritation effect is very weak. There is no local and vesicant effect. Irritating and lacrimatory actions are very weak. None out of three marmots dies at ct equals 9,000.
- (550) Irritating and lacrimatory actions are very weak. Irritation effect and vesicant effect are very weak. None out of five marmots dies at ct equals 5,000.
- (600)
- (650) Irritation effect: Although inferior to phosgene, it is superior to military gases when used on marmots. Irritating effect: Markedly inferior to chloroacetyl urea. Irritating effect on the human body is strong, but recovery is rapid.
- (700) 2 out of 10 marmots die at ct equals 10, 3 out of 5 die at ct equals 25, and 5 out of 5 die at 100.
- (750) 2 out of 5 marmots die at ct equals 25 and 3 out of 5 die at 100. Resembles the above-mentioned agent.
- (800) Somewhat inferior to octansauure-(4-oxy-3-methoxy-benzyl amid).
- (850) 6 out of 20 marmots die at ct equals 10, 9 out of 17 die at 20, and 4 out of 5 die at 100. Resembles octansauure-(4-oxy-3-methoxy-benzyl amid).
- (900) 3 out of 5 marmots die at ct equals 25. Similar to octansauure-(4-oxy-3-methoxy-benzyl amid).
- (950) Irritation effect is weak. Irritating and lacrimatory actions are weak. Appears to be somewhat stronger than dichloroacetoxin.
- (1000) Both inhalation and irritating effects are weak. ct equals over 3,000 (marmot). ct equals over 25,000 (rabbit).



|      | Structural<br>Formula                                    | Physical<br>state | Boiling<br>point  | Melting<br>point | Physiological<br>action |
|------|--|-------------------|-------------------|------------------|-------------------------|
|      | 2-chloro acetyl-p-<br>kresol                             | Crystal           |                   | 67               | Irritant                |
|      | 2-chloro aceto-o-<br>kresol                              | Crystal           |                   | 67               | Irritant                |
|      | 2-chloro aceto-m-<br>kresol                              | Crystal           |                   | 102-103.5        | Irritant                |
|      | 2,4,6-trichloro<br>acetophenon                           | Liquid            |                   | 30-31.0          |                         |
|      | 2,4,6-trichloro<br>acetophenon                           | Liquid            | 145<br>(25mm)     |                  | Irritant                |
| (56) | 2,4,6-trichloro<br>acetophenon oxim                      | Solid             |                   | 155-156          | Irritant                |
|      | Yperit C <sup>2</sup> (Report<br>No. 12)                 | Liquid            |                   |                  | Vesicant                |
|      | Yperit C <sup>3</sup> (Report<br>No. 13)                 | Liquid            |                   |                  | Vesicant                |
|      | Sym-tetrachlorodiarsino<br>propyl chlorid                | Liquid            | 47-49<br>(27mm)   | Under<br>-50     | Vesicant                |
|      | Methyl arsin   | Gas               | 2                 |                  | Systemic<br>poison      |
| (57) | Butyl arsin  | Liquid            | 94-99             |                  | Systemic<br>poison      |
| (58) | DL'-difuryl cyan<br>arsin                                | Liquid            | 127-130<br>(25mm) |                  | Vesicant                |
| (59) | Phosphorus di-<br>arsin                                  | Solid             |                   | 84               |                         |
| (60) | Phosphorus chlorid<br>diarsinid                          | Solid             |                   | 165              |                         |
|      | Ethylen diarsinyl<br>dichlor diarsin                     | Crystal           |                   | 95               | Irritant                |
|      | Ethylen diarsinyl<br>dibrom diarsin                      | Crystal           |                   | 109-110          | Irritant                |
|      | P-dimethyl amino<br>phenyl dichlor arsin<br>hydrochlorid | Crystal           |                   | 110-110.5        | Irritant                |
|      | P-dimethyl amino dibrom<br>arsin hydrochlorid            | Crystal           |                   | 109-109.5        | Irritant                |
| (61) | Di-3-pyridyl chlor<br>arsin hydrochlorid                 | Crystal           |                   | 160-161          |                         |

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CS ID USA TRANSLATION

REGISTRY NUMBER

CASE NUMBER

63a

No. Toxic character

- (41/0) Irritating and lacrimatory actions are twice those of chlor aceto phenon.
- (42/ Irritating action is fairly strong, but weaker than that of chlor aceto phenon.
- (43/ Irritating action is fairly strong but weaker than that of chlor aceto phenon.
- (44/
- (45/ Lacrimatory effect: Markedly inferior to chlor aceto phenone. Inhalation effect: Weaker than phosgene. None out of two rabbits dies at ct equals 10,000. Vesicant action: None.
- (46/ Irritating action: Markedly inferior to chlor aceto phenone. Vesicant action: Not detected.
- (47/0 Vesicant effect: Equal to or slightly inferior to yperite. Skin application effect: Same as yperite.
- (48/ Same as above.
- (49/
- (50/ Irritability is weak. Toxic symptoms resembles those of cyanic acid. Two out of three and four out of five marmots die at ct equals 10,000. One out of five marmots dies at 5,000.
- (51/ Inhalation effect: Markedly inferior to phosgene. Two out of five marmots die at ct equals 10,000 and one out of five dies at 5,000.
- (52/ Vesicant effect on skin: Vesicant action resembles that of lewisite but is weaker. Hypodermic injection (lethal dose): 50 percent lethal dose for rabbits is 5-10 mg/kg. Weak when compared with lewisite.
- (53/
- (54/
- 0(55/ Inhalation effect: Somewhat inferior to diphenyl cyan arsin. Four out of ten marmots die at ct equals 1,500.
- 0(56/ Inhalation effect: Slightly inferior to diphenyl cyan arsin. Three out of 10 marmots die at ct equals 1,500 and 5 out of 10 die at 3,000.
- 0(57/ Irritating effect: Markedly inferior to diphenyl cyan arsin. None out of five rabbits dies at ct equals 1,700.
- 0(58/ Same as above.
- (59/

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OS ID USA TRANSLATION

REGISTRY NUMBER

PAGE NUMBER

642

No. Toxic character

(60) Irritating effect: Markedly inferior to chlor aceto phenone and dichloro  
cyan arsin. Inhalation effect: Inferior to phosgene. None out of two  
rabbits dies at ct equals 10,000.



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